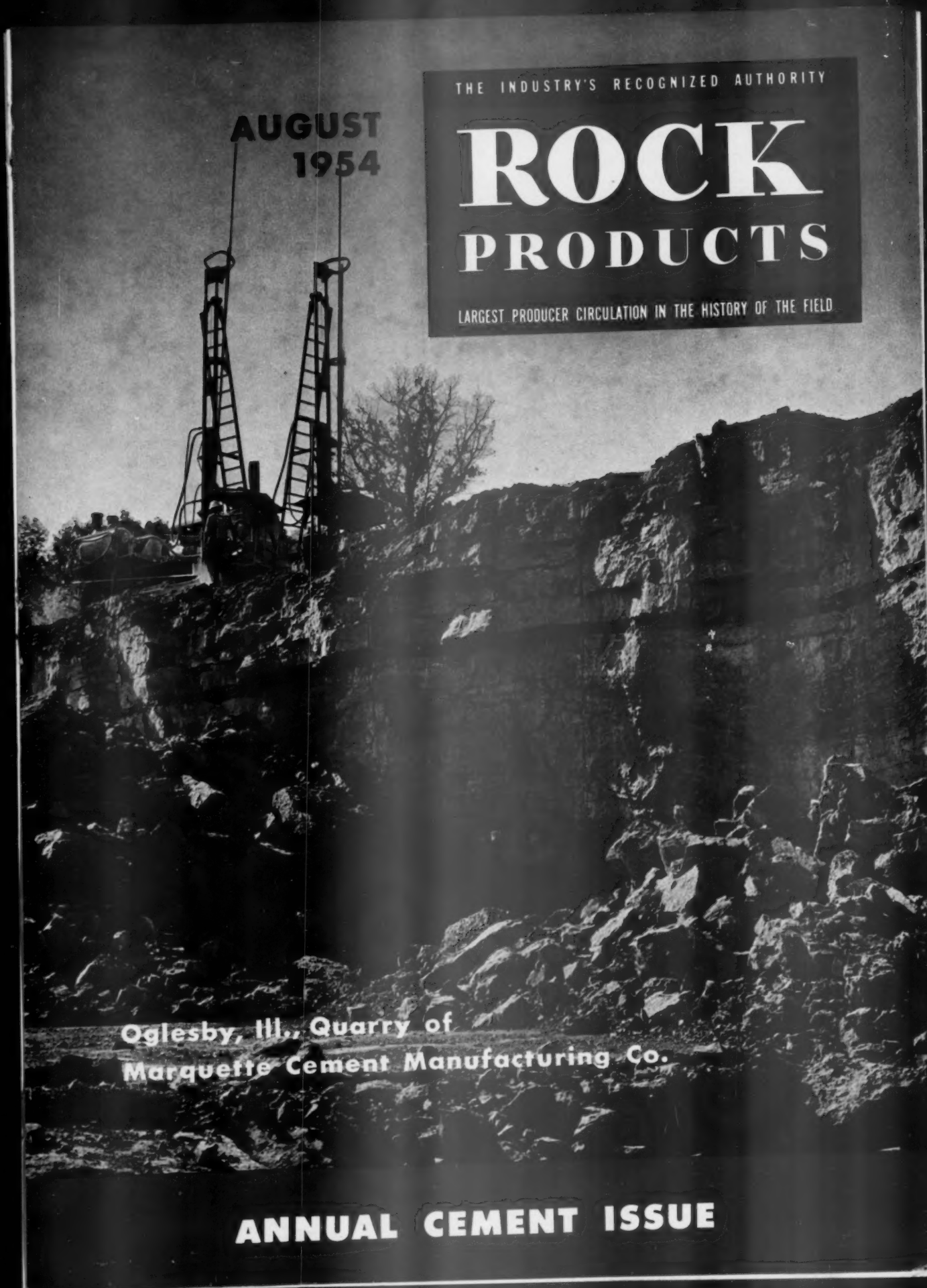


THE INDUSTRY'S RECOGNIZED AUTHORITY

ROCK PRODUCTS

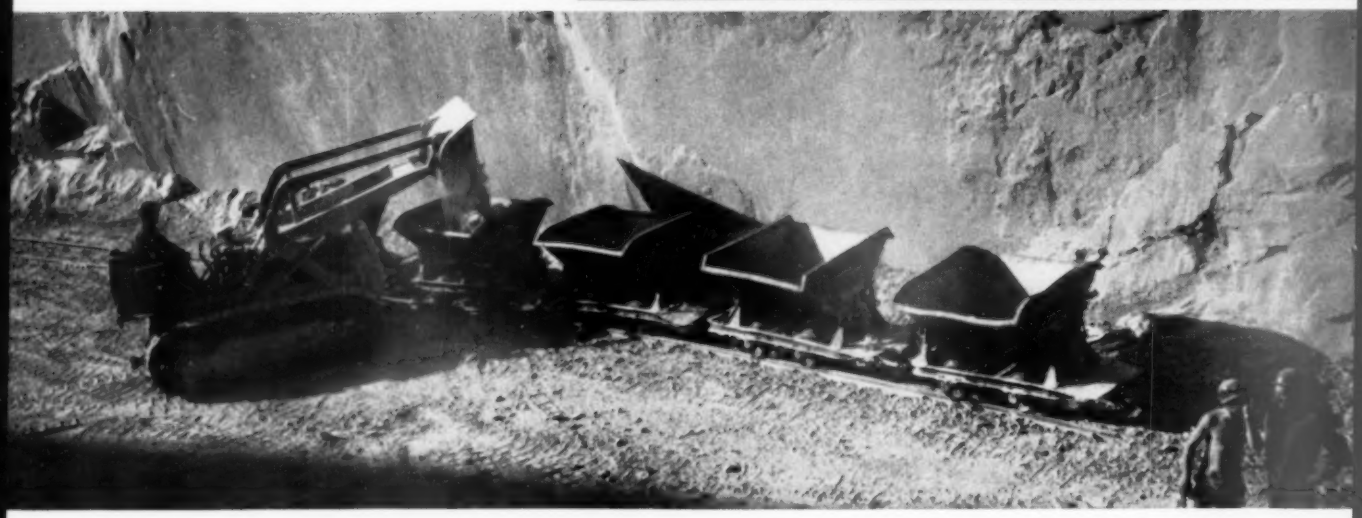
LARGEST PRODUCER CIRCULATION IN THE HISTORY OF THE FIELD

AUGUST 1954

Oglesby, Ill., Quarry of Marquette Cement Manufacturing Co.

ANNUAL CEMENT ISSUE

RUGGED FOR ROCK



THERE's a lot of dusty, equipment-busting rock around a pit or quarry. The Caterpillar HT4 Shovel is built to produce in conditions like these, and to *keep on producing* for thousands of hours without tinkering, coddling or down time.

Carefully sealed hydraulic system and engine keep oil *in* and dirt *out*. Effective air, fuel and oil filters protect the rugged Cat* Diesel Engine from harmful abrasive dust. Engine, tractor and shovel are *matched*, with extra strength where it's needed. It all adds up to a machine that's built to stay on the job and out of the shop.

The HT4 Shovel shown here digs rock and loads and hauls buggies in a quarry at Kananaskis, Alberta, for Loder's Lime Co., Ltd. When both of the plant's kilns are working, this Cat Shovel handles 35 buggies a day. Plant capacity is 70 tons of lime per eight hours. The versatile HT4 can also bulldoze, clean up and do light stripping. It has excellent operator visibility, and is compact and maneuverable for work in tight places.

T. A. Barton, superintendent, says, "Our Cat HT4 Shovel is just the ticket for this work. It gives us no trouble, and never hesitates to start in any weather." Its Caterpillar fuel system and Diesel Engine are *foul-free* all through the power range—idling, lugging, or full throttle. And this on low-cost No. 2 furnace oil! Mr. Barton reports a fuel saving of 50% over his former tractor!

Your Caterpillar Dealer—who backs his sales with fast service and genuine factory parts—will gladly demonstrate, on your own job, the shovel that will do most work for you at lowest cost. Call him now.

Caterpillar Tractor Co., Peoria, Illinois.

CATERPILLAR*

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NAME THE DATE... YOUR DEALER WILL DEMONSTRATE

RESEARCH KEEPS **B.F.Goodrich** FIRST IN RUBBER

Photo courtesy United Electric Coal Companies, Chicago, Ill.

Chewing up the earth— 40 tons a minute

A typical example of B. F. Goodrich improvement in rubber

THAT machine strips overburden, exposing seams of coal that can then be mined. Huge buckets, bolted to the revolving wheel at left, bite into the earth, scoop it up and over onto a moving rubber belt that carries it away to be dumped.

But imagine the tearing jar on the belt from two-ton bucket loads of dirt and rock hitting it every few seconds, hour after hour. The banging and crashing would be enough to rip any ordinary belt to shreds.

Then a B. F. Goodrich man told the mine owner about the B. F. Goodrich *cord* belt. Cords, running lengthwise, are held in place by rubber. Under a sharp blow the cords can "give" temporarily, letting the rubber take the shock.

It was a new kind of belt—new, that is, 10 years ago when the belt was put to work on this job. Speed of strip mining increased 400%, the cost was lower because B. F. Goodrich had made improvements in a belt so it would stand rugged service like this.

Reducing costs for business is our business. Others may do it by cutting the original price. We do it by a constant program of improvement that results in products that stand harder use, last longer, and so cost far less when measured in terms of useful life. Don't be too sure that the service you are getting from belting, hose, tank linings or any rubber product is all you can expect until you learn what B. F. Goodrich has done recently to improve it. Call in your BFG distributor or write *The B. F. Goodrich Company, Dept. M-293, Akron 18, Ohio.*

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ROCK PRODUCTS

THE INDUSTRY'S RECOGNIZED AUTHORITY — LARGEST PRODUCER CIRCULATION IN THE HISTORY OF THE FIELD

August 1954

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- ✻ extreme simplicity of design in body and dumping mechanism for lasting durability, less downtime, less maintenance.
- ✻ rugged, all-welded construction for heavy rock and ore, lighter construction for lighter bulk materials.
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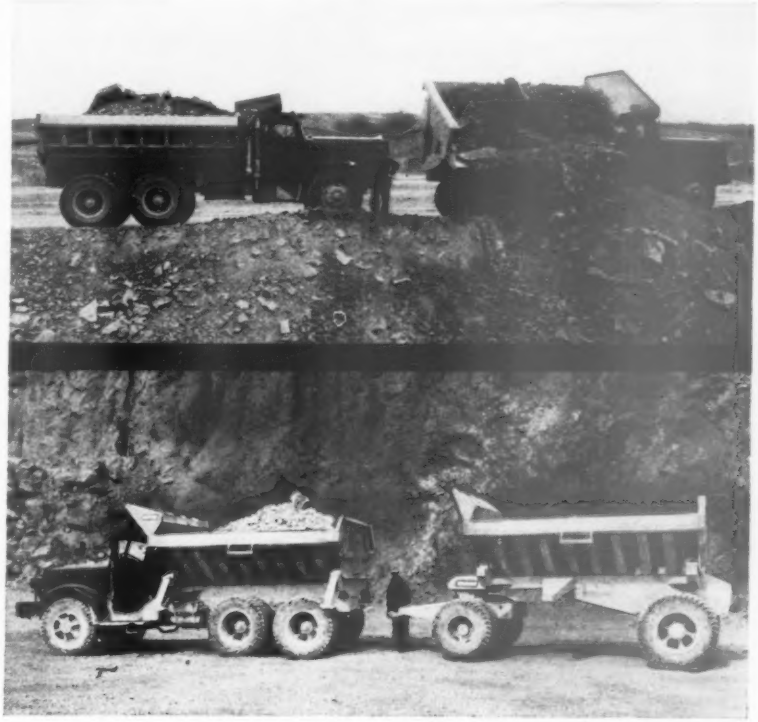

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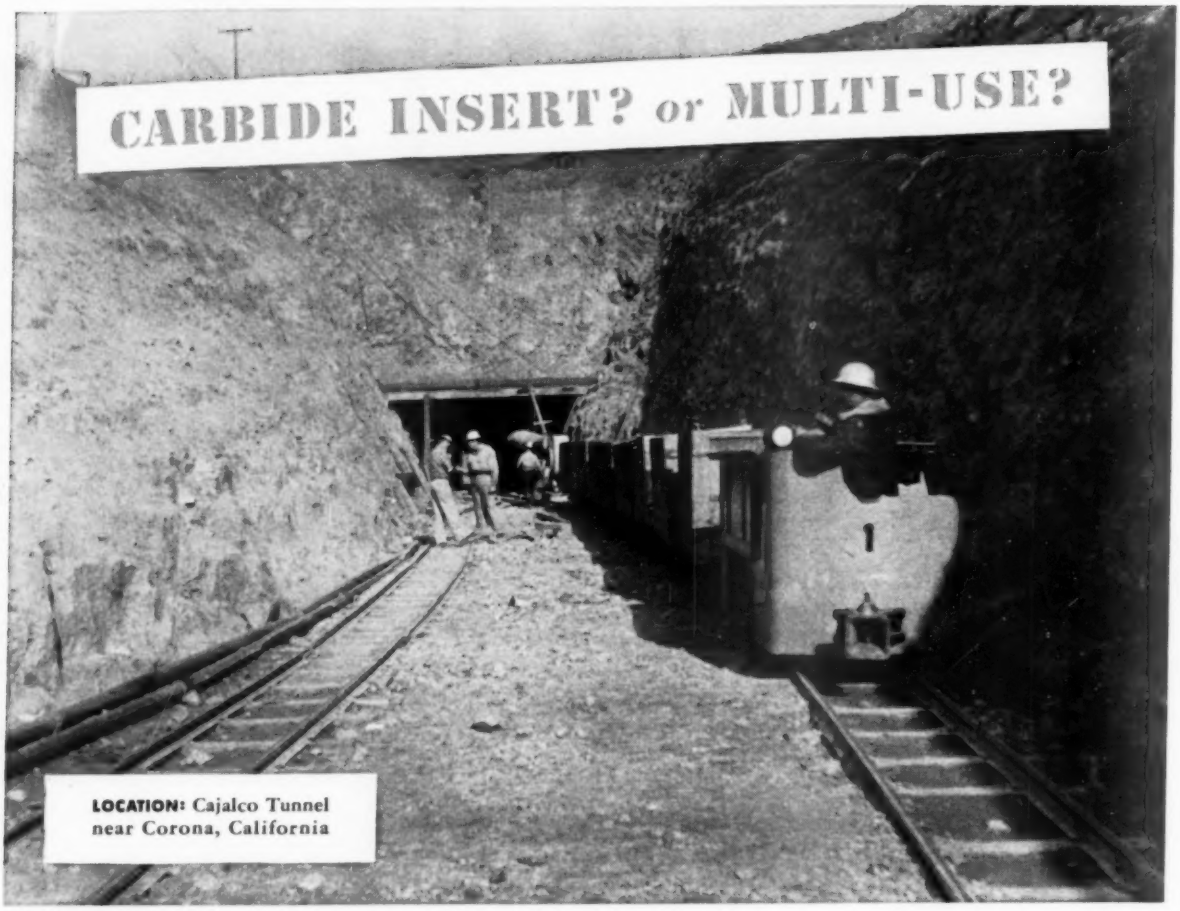

"Our experience with TIMKEN® carbide insert bits on Big Cliff Dam job sold us on using them for Cajalco Tunnel", *says The Shea Company*

WORKING on a diversion tunnel at the Big Cliff Dam project in Oregon, The Shea Company found that Timken® carbide insert bits did the job best. So, when it came time to start the Cajalco Tunnel, W. F. Rennebohn, General Manager, The Shea Company, again chose Timken carbide insert bits.

For hard and abrasive ground, Timken carbide insert bits are the best answer for highest speed. They're also most economical for constant-gage holes, small diameter blast holes and very deep holes.

But they're *not* the best solution to *all* your drilling problems.

For ordinary ground, Timken multi-use bits are most economical. With correct and controlled reconditioning, they'll give the lowest cost per foot of hole when full increments of steel can be drilled.

Both Timken carbide insert and multi-use bits are interchangeable in the same thread series. A wide range of different Timken bits fit the same drill steel. As the ground changes, you can change bits quickly, easily—right on the job.

For the best bit type for *your* particular drilling requirements, call on the Timken Rock Bit Engineering Service. Write The Timken Roller Bearing Company, Rock Bit Division, Canton 6, Ohio. Cable address: "TIMROSCO".

Timken threaded multi-use rock bit

Timken threaded carbide insert rock bit

... your best bet for the best bit ... for every job

TIMKEN

YOU THINK YOUR DIGGING PROBLEMS ARE TOUGH

HERE'S as tough a bit of mining as ever tested out a shovel. This is Kyanite, an aluminum silicate used in ceramics to offset the shrinking of clays.

Kyanite is hard — often reaching a hardness of 7.

Northwests have the stamina for mining operations like this. The Northwest Dual Independent Crowd utilizes force most other independent crowds waste, giving that extra push for hard rock work. The "Feather-Touch" Clutch Control makes operation easy without pumps, compressors, valves, or tubing. The Cushion Clutch eliminates overloads before they can damage operating machinery. Cast steel bases and machinery side frames take the shocks of rock digging. Uniform Pressure Swing Clutches eliminate the jerks and grabs that make spotting heavy loads difficult. These and many other Northwest advantages combine to make the Northwest a *real* Rock Shovel.

If you have a pit problem or are modernizing get complete details on Northwest equipment. Ask to see a Northwest Man.

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● Perhaps your problem calls for rubber tired equipment. Don't buy a Truck Crane 'till you have the whole story on the Northwest.

NORTHWEST

Convertible for any Mining Material Handling or Excavation Problem

PRECO *Back-Rippers*

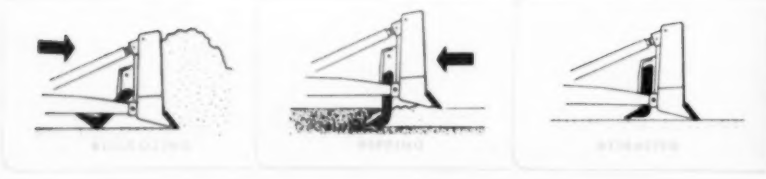
BREAKS UP SHALE WITHOUT BLASTING OR CRUSHING!

Preco Back-Rippers automatically rip as the tractor backs up... then ride on top of the ground as the tractor moves forward. They also can be pinned up out of the way. In addition to stripping operations, they speed up all dozing work — road building and maintenance, pioneering, mining, excavation and for push loading scrapers.

NEW METHOD SPEEDS STRIPPING AT QUARRY OF BASALT ROCK CO., CALIFORNIA

They have eliminated all blasting and primary crushing in stripping shale at the aggregate plant of the Basalt Rock Co., at Napa, California. Preco Back-Rippers, mounted on the reverse side of the moldboard of the Company's Caterpillar D-8 Tractors, do the complete job of breaking up the raw shale into pieces small enough to feed directly into the hammermill. This new method saves the company both time and money. The stripping job is materially speeded up while the company has eliminated the expense of other costly equipment.

SEE YOUR "CATERPILLAR" DEALER *or write us for information*



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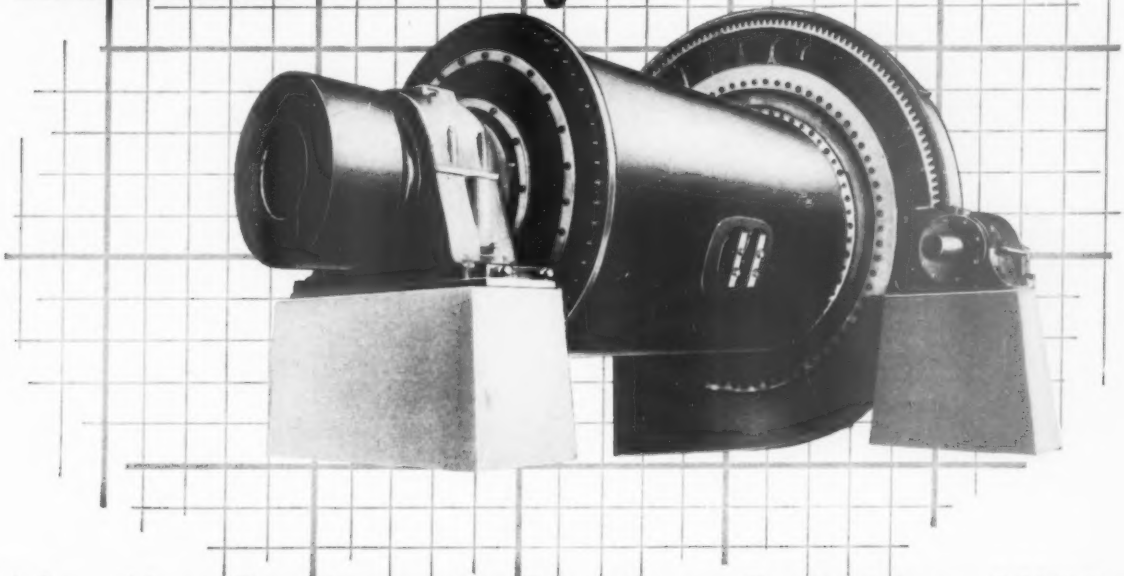
Preco Back-Rippers are available for "Caterpillar" models including straight blade, angling blade and U-blade bulldozers.

Here's the Inside Story!



It's the Design of Traylor Grinding Mills that improves quality...reduces operating costs

Every Traylor Grinding Mill is individually engineered and built to fit your own particular needs. As a result each mill delivers a uniform product . . . of the right fineness *for you*.

All main bearings on Traylor Ball, Rod and Compartment Mills are pressure lubricated. A high pressure pump coats each trunnion with a film of grease which lifts and floats the mill to overcome high starting torques and eliminates undue wear caused by "dry" starting.

Precision cut steel driving gears, trunnions cast integral with the detachable heads, shell liners of manganese or alloy steel . . . all indicate the improved design and construction features that are standard with Traylor.

A Traylor LEADS TO GREATER PROFITS

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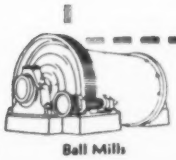
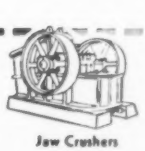
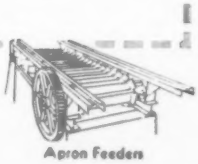


Ball Mills



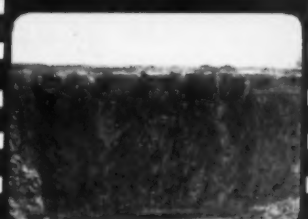
Jaw Crushers

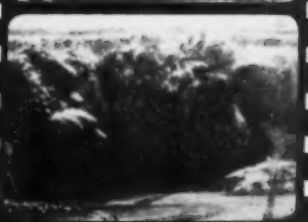


Apron Feeders

The INSIDE STORY

A MOTION PICTURE DISCUSSING THE PRINCIPLES OF BLAST DETONATION





New Atlas Movie Shows Advanced Blasting Techniques

THE NEW Atlas movie "The Inside Story," is a technical discussion of blasting methods used in quarries, strippings and construction work. It shows what happens between the firing of the cap and the blast of the explosives column. It shows how point of detonation affects rock movement . . . the most effective use of millisecond delays . . . the difference in action between progressive and alternate patterns . . . alternate velocity loading and what this new method will do toward refining millisecond delay blasting.

To get "The Inside Story" for your organization, simply write to the nearest Atlas office listed at right or to our home office. Let us know approximately when you will want it, the type of meeting you are planning and we will be glad to work out the arrangements at no cost to you.

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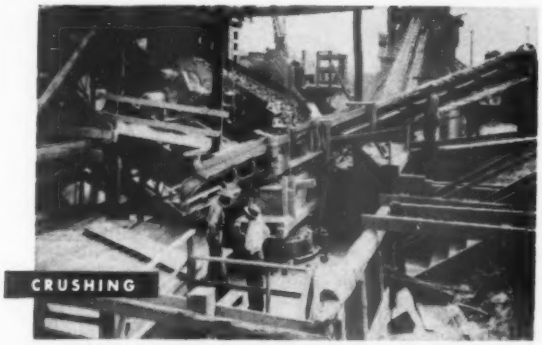

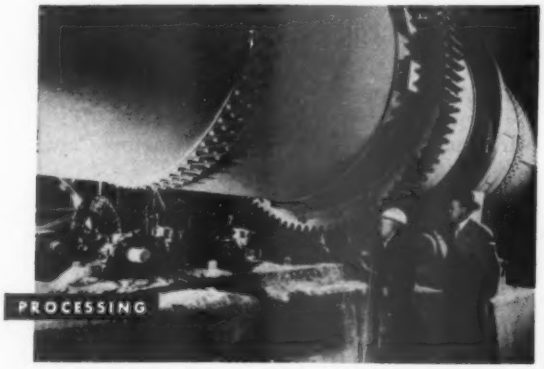

Whatever your activity — whether it's quarrying, crushing, processing, or hauling —Gulf lubricants and fuels will help contribute to a smoother over-all operation with lower maintenance costs.

Use Gulf lubricating oils and greases to insure an extra margin of protection for every gear and bearing in your equipment. They will provide a tough and stable film that prevents excessive wear and cuts maintenance costs. Gulf motor oils help prevent the formation of rust, sludge, and varnish—engines use less oil and require fewer overhauls.

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And remember too that Gulf provides excellent engineering service to make sure that the most suitable lubricants and fuels are used for every unit and climatic condition.

Contact your nearest Gulf office today and let us discuss with you how Gulf products and fine service can help your operation.

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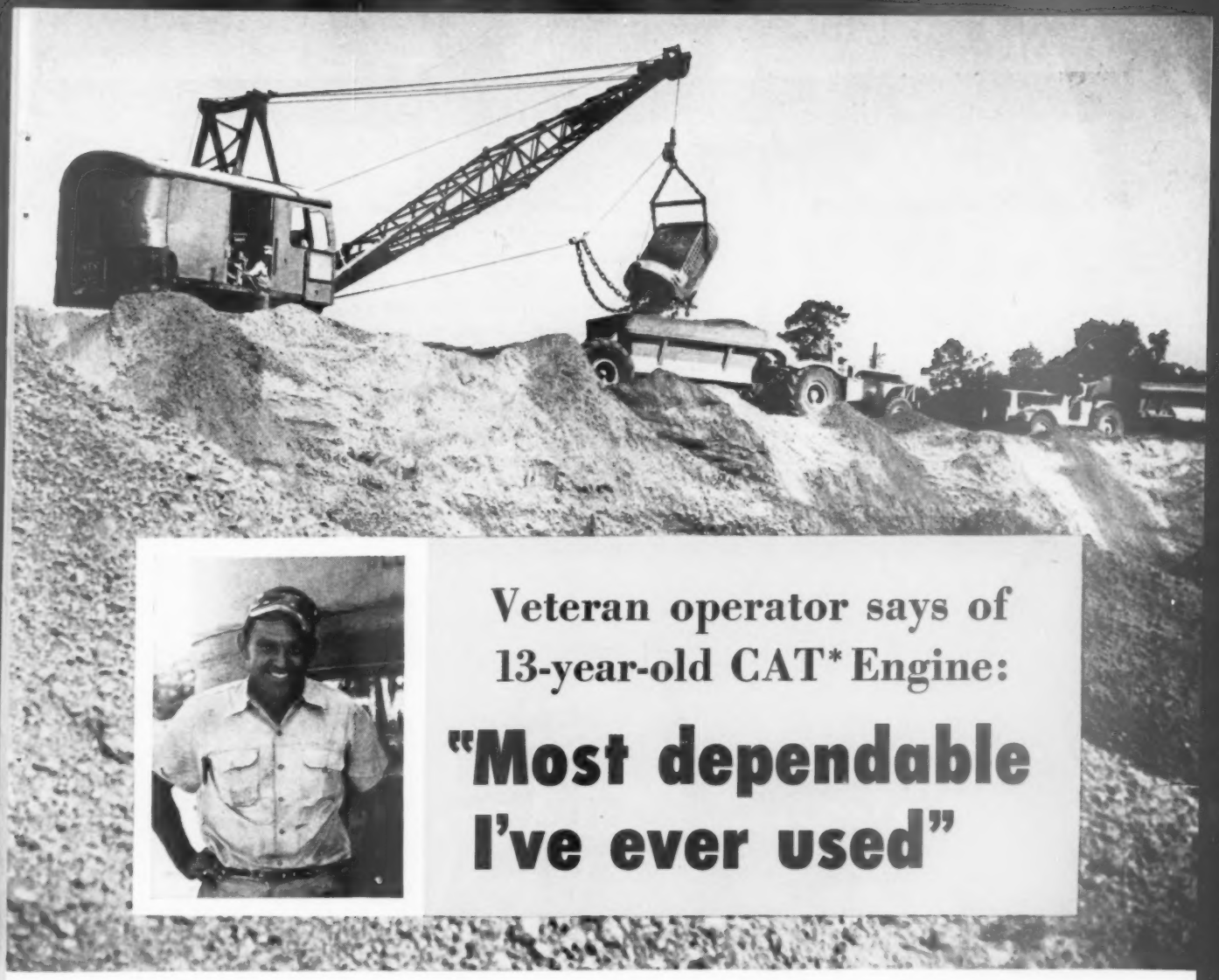


Veteran operator says of 13-year-old CAT* Engine:

"Most dependable I've ever used"

"I've been with this machine for three years, and an operator for 16 years," says C. S. Batson, operator for Reynolds and Williams, Little Rock, Ark., "and Cat Engines are the most dependable I've ever used." He is shown here with a Northwest Shovel whose Caterpillar D13000 Engine is 13 years old.

The shovel loads out five Caterpillar DW10s and W10 Wagons, 20 loads of base gravel per hour, for an 11-mile stretch of State Highway No. 4 near Little Rock. In one 21-day period, the company put down 35,000 cu. yd. on this stretch. The shovel strips topsoil for three hours, and then loads gravel for 10 hours every day. Output is 360 cu. yd. of topsoil and 1800 cu. yd. of red clay gravel daily.

That's high production for a shovel whose engine is a veteran of more than 40,000 hours. All Caterpillar Diesels are built to deliver many thousand hours of economical, pamper-free performance, thanks to such features as specially hardened crankshaft journals and long-lived aluminum alloy bearings. Really efficient filters and seals protect every engine's factory-built precision, even in abrasive dust working around rock. Important in cutting costs is the ability of every Caterpillar Diesel to deliver full and *foul-free* power on inexpensive No. 2 furnace oil.

There are 12 sizes of Caterpillar Engines and Electric Sets, to 500 HP and 315 KW. Leading manufacturers can supply Caterpillar power in their excavators, compressors, with rock crushers and other machinery. Your Caterpillar Dealer – who provides fast service and genuine factory parts – can help you select the Cat power unit that will do most work at lowest cost for *you*. Call him today.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

CATERPILLAR*

*Both Cat and Caterpillar are registered trademarks—®

SPECIFY CAT POWER FOR HIGH-PROFIT PERFORMANCE

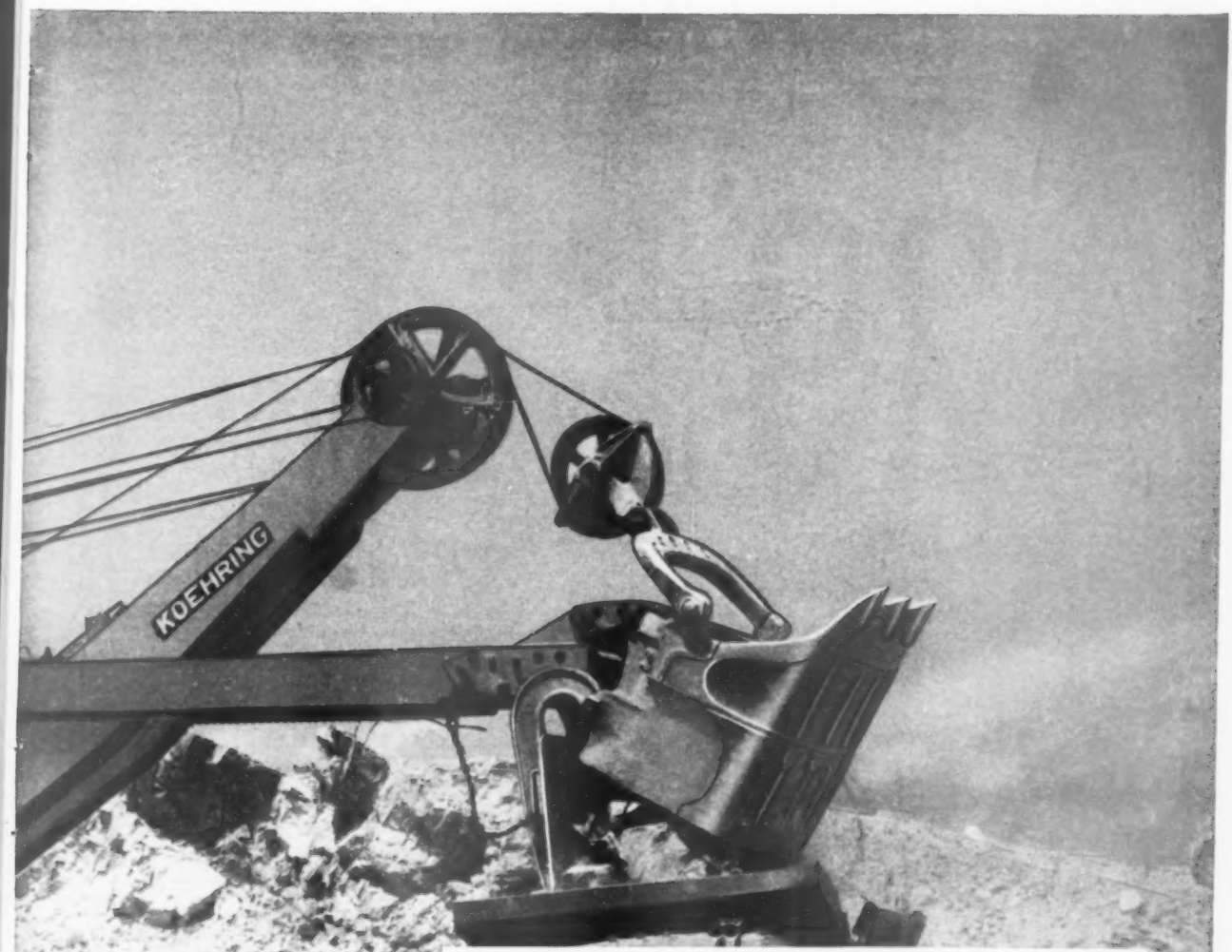
Measure excavators

by price per pound of lifting capacity

In analyzing shovel operation, you will find that price per pound of lifting capacity on crane rating is also an excellent measurement of excavator value. Remember, lift capacity is *work capacity*. Obviously, the machine with the heaviest lift rating not only picks up larger crane loads — it also has more strength, speed and stability to handle bigger loads faster with every excavator attachment.

Check Koehring lift ratings shown on the next page — then ask your Koehring distributor to give you the figures on price per pound of lifting capacity.

KOEHRING COMPANY Milwaukee 16, Wis. Subsidiaries: JOHNSON PARSONS • KWIK-MIX



COMPARE FOR YOURSELF:

KOEHRING MODEL	SIZE DIPPER	KOEHRING LIFT CAPACITIES (Crawler ratings based on 75% of tipping load. Rubber-tired machines — 85% of tipping load)		PRICE PER POUND OF LIFT CAPACITY*
205 CRAWLER	½-Yd.	20,000 lbs.	30-foot boom at 10-ft. radius	?
205 ON RUBBER	½-Yd.	30,000 lbs.	25-foot boom at 12-ft. radius	?
304 CRAWLER	¾-Yd.	27,800 lbs.	35-foot boom at 12-ft. radius	?
304 ON RUBBER	¾-Yd.	50,000 lbs.	30-foot boom at 10-ft. radius	?
405 CRAWLER	1-Yd.	40,000 lbs.	40-foot boom at 12-ft. radius	?
605 CRAWLER	1½-Yds.	72,300 lbs.	50-foot boom at 12-ft. radius	?
1005 CRAWLER	2½-Yds.	159,000 lbs.	50-foot boom at 12-ft. radius	?

Figures available on request — ask your Koehring distributor for them.

KOEHRING HEAVY DUTY

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Gyratory
CRUSHERS

29 in 3 YEARS!

SUPERIOR primary and secondary gyratory crushers have been making a big name for themselves since they were introduced three years ago. Twenty-six are installed and operating... three are under construction now, including a huge 60 x 109 machine — largest crusher the world has ever known.

A policy of simplifying design and controlling quality has made Allis-Chalmers the leading builder of crushers. A continuing policy of *improving* crusher design has greatly extended this leadership.

This vast backlog of crusher application experience — over 75 years of it — is always available to you when you want to make sure of a successful installation. Allis-Chalmers, Milwaukee 1, Wisconsin.

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Superior is an Allis-Chalmers trademark.

NEW 32-Page Book Contains Helpful Crushing Data

Packed with factual "how to" information on figuring hp requirements, impact and compressive strengths.

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It's a book you'll want to have and keep!

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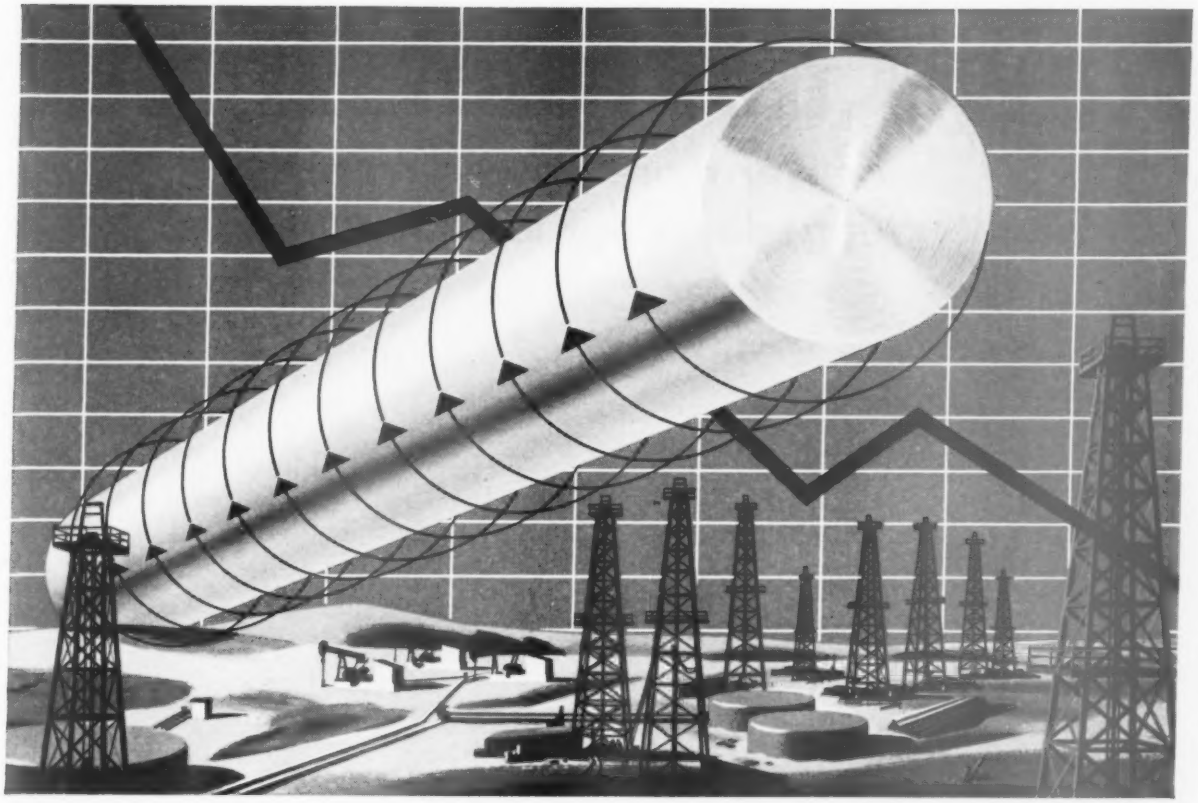


POWER LOSS IS PROFIT LOSS!

Everywhere a shaft is turning you may be losing power due to friction. This power you are paying for...power that could produce more every day. Figure that loss and you'll see why the price of Shafer Anti-friction Roller Bearings adds to profit—not to costs.

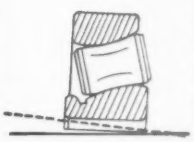
For more than 35 years the exclusive Shafer ConCaVex Bearing has been carrying the heavy loads in all industry ...the higher shock loads...and saving money—by saving power.

Available in wide range of types. The complete Shafer line offers you pillow blocks, flange units, take-up units, cartridge units in a wide selection of sizes for normal or heavy-duty service. Write today for Catalog 51. Shafer Bearing Division, 801 Burlington Ave., Downers Grove, Ill.

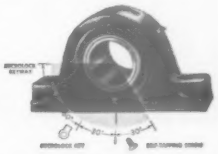
SHAFER BEARING DIVISION OF

CHAIN BELT COMPANY

Only Shafer Offers All Three Outstanding Features



Self-Alignment—The exclusive Shafer ConCaVex design of concave rollers and convex races provides compensation for shaft deflections, misalignment, installation inaccuracies, radical and thrust loads.



Positive Sealing—Exclusive "Z" seal is true self-aligning seal having ample radial float to correct for radial displacement, yet retains positive sealing. This all-metal seal effectively keeps grease in and keeps dirt out to prolong even further the exceptional long life of this bearing.

Easy Adjustment—Another Shafer exclusive—Micro-Lock Adjustment, provides fast, positive bearing adjustment to compensate for wear in small increments. Has twelve separate points of accurate adjustment, that are made quickly with nothing more than a screw driver.

New Chevrolet Trucks

deliver more power, more ruggedness, for less money!

Making sure the truck you buy has plenty of power and chassis ruggedness is good business in any man's book. Getting the money-saving extra power and ruggedness of Chevrolet trucks is *better* business in any man's book*keeping*.

EXTRA POWER MEANS BIGGER SAVINGS

No doubt about it, the extra power you get from new high-compression Chevrolet truck engines means you're going to pay out less for gasoline. Over a year, that adds up to a sizeable savings. Increased power brings time-saving benefits, too—greater acceleration and hill-climbing ability . . . you haul faster, get the job done quicker!

GREATER RUGGEDNESS CUTS OPERATING COSTS

Heavier axle shafts and wheel hubs on two-ton models; bigger, more durable clutches on light- and heavy-duty models; stronger, more rigid frames on all models. These features pay off in extra-low upkeep costs . . . extra miles of dependable truck life.

But these *while-you-drive* savings aren't all, by a long shot. You even save *when you buy*. For Chevrolet is America's lowest-priced line of trucks. Stop by your Chevrolet dealer's soon to see the "savingest" trucks on the road. He'll show you models ideally suited to your job, with facts to prove you'll get more for your money. Chevrolet Division of General Motors, Detroit 2, Mich.

CHEVROLET

MOST TRUSTWORTHY TRUCKS ON ANY JOB!

CHEVROLET ADVANCE-DESIGN TRUCK FEATURES

THREE GREAT ENGINES—The new "Jobmaster 261" engine* for extra heavy hauling. The "Thriftmaster 235" or "Loadmaster 235" for light-, medium- and heavy-duty hauling. **NEW TRUCK HYDRA-MATIC TRANSMISSION***—offered on ½-, ¾- and 1-ton models. Heavy-Duty **SYNCHRO-MESH TRANSMISSION**—for fast, smooth shifting. **DIAPHRAGM SPRING CLUTCH**—improved-action engagement. **HYPOID REAR AXLE**—for longer life on all models. **TORQUE-ACTION BRAKES**—on all wheels on light- and medium-duty models. **TWIN-ACTION REAR WHEEL BRAKES**—on heavy-duty models. **DUAL-SHOE PARKING BRAKE**—greater holding ability on heavy-duty models. **NEW RIDE CONTROL SEAT***—eliminates backrubbing. **NEW, LARGER UNIT-DESIGNED PICKUP AND PLATFORM STAKE BODIES**—give increased load space. **COMFORTMASTER CAB**—offers greater comfort, convenience and safety. **PANORAMIC WINDSHIELD**—for increased driver vision. **WIDE-BASE WHEELS**—for increased tire mileage. **BALL-GEAR STEERING**—easier, safer handling. **ADVANCE-DESIGN STYLING**—rugged, handsome appearance.

**Optional at extra cost. Ride Control Seat is available on all cabs of 1½- and 2-ton models, standard cabs only in other models. "Jobmaster 261" engine available on 2-ton models, truck Hydra-Matic transmission on ½-, ¾- and 1-ton models.*

an **ACCO** product

American Cable "Green Strand" Wire Rope

What Wire Rope Do You Use on Your Carrier Scrapers?

• A complete description of a scraper cable is as long as your arm. But all you have to remember, if you are buying American Cable, is simply: TRU-LAY Streamlined Scraper Cable. And here's what you get, and why—

6 x 25 Flattened Strand—This means six strands of twenty-five wires each wound around triangularly shaped wires in the center of each strand. One flat side of the center wires of each strand faces out providing a relatively flat surface on the strand. The outsides of the six strands together make a smoother surface which gives the rope a much better bearing area against small sheaves and drums.

Independent Wire Rope Core—This adds considerably to the rope's breaking strength, and provides a solid steel core which keeps the rope from pulling down or flattening out on the small sheaves of a carrier scraper.

Lang Lay—When the wires in the strands are laid in the same cross-direction as the strands in the rope, the rope is Lang Lay. This makes the rope last longer because more of the outside wires are exposed to wear. It also makes the rope withstand more bending because of the helix of the wires. The crankiness of Lang Lay is removed by American Cable by preforming.

TRU-LAY Preformed—American Cable's Streamlined Scraper Cable is preformed to make it handle easier and last longer in bending around small sheaves. When wires do break, they stay in place instead of barbing out to slice hands and snag clothing.

Improved Plow Steel—That's what TRU-LAY Preformed is made of. The wire in this all-steel wire rope has an average tensile strength of 260,000 pounds per square inch. Look for the *green strand* which identifies this strong wire rope.

Just ask for TRU-LAY Streamlined Scraper Cable next time and every time you need rope for your carrier scrapers. You can also use it for the blade rope on your bulldozers. Your American Cable distributor stocks it and can give you quick service. Call him today or write our Wilkes-Barre, Pa., office for further information.

ACCO

TRADE MARK

American Cable Division

AMERICAN CHAIN & CABLE

Wilkes-Barre, Pa., Atlanta, Chicago, Denver, Houston, Los Angeles, New York, Odessa, Tex., Philadelphia, Pittsburgh, Portland, Ore., San Francisco, Bridgeport, Conn.

plus ACCO Registered Wire Rope Slings

Six 6" dia. DorrClones recover salable fine agstone... relieve overloaded fines recovery system... at G.&W.H. Corson, Inc.

General view of present fines recovery layout. Bowl Desilter rake product is discharged to flight conveyor and carried to stockpile. DorrClone underflow is discharged directly on ground and bulldozed to stockpile. Desiltor and DorrClone overflows go to waste.

Closeup of six DorrClones installed on superstructure for direct underflow discharge.

Back in 1951, G. & W. H. Corson, Inc. installed a Dorrco Bowl Desiltor to recover plus 325 mesh agricultural limestone from wash water at their operation near Philadelphia, Pa. Results were completely satisfactory — until flow was doubled and the solids loading could no longer be handled by the Desiltor alone.

Economical answer to the problem was the six 6" DorrClones shown in the closeup above. These units now handle 600 of the current 900 gpm total flow. Making a 25 to 30 micron separation, they recover an average of 7 tons per hour of fine agstone at better than 50% solids. The Desiltor recovers 3½ tons per hour at 70 to 75% solids. Total recovery of salable product from both units averages 10 to 12 tons per hour.

This is but one example of how DorrClones can fit into the fine solids recovery picture. If you're losing valuable fines, their modest cost, high capacity-for-size and ease of installation will interest you too. Write for Bulletin 2501, or better still, give us the details of your problem. No obligation, of course. The Dorr Company, Stamford, Conn. *In Canada*, 26 St. Clair Avenue East, Toronto 5.

Better tools TODAY to meet tomorrow's demand

DORRCO

DORR

FIFTY YEARS 1904-1954

WORLD-WIDE RESEARCH • ENGINEERING • EQUIPMENT

THE DORR COMPANY • ENGINEERS • STAMFORD, CONN.

Offices, Associated Companies or Representatives in principal cities of the world.

Hardfacing

Check the **COMPLETE VICTOR LINE**

VICTOR hardfacing alloys save you time and money with faster application, smoother deposits, longer wear!

See your VICTOR dealer now . . . get the facts, and you'll get VICTOR!

VICTOR for welding

Profitable dealerships open; inquire now!

For Manual Application

THIS HARD-FACING ROD	FOR THESE CONDITIONS	FOR THIS EQUIPMENT	APPLI-CATION
VICTORTUBE	Severe abrasion	Scarifier teeth, dredge cutter blades, posthole augers, oil field tools, ditcher teeth	Acety. AC-DC Elec.
VICTORTUBE "SPECIAL"	Abrasion, severe impact	Oilfield bits, rock bits	Acety. only
VICTOR TUNGSMOOTH	Thin cutting edges	Coal cutters, brick augers, pug mill knives, screw conveyors, farm tools	Acety. AC-DC Elec.
VICTORITE	Earth abrasion or sliding friction	Plowshares, cultivators, steel mill guides, cement chutes, shaft bearings, rolling mill guides	Acety. AC-DC Elec.
TUBE VICTORITE	Abrasion, impact	Plow points and farm tools	Acety. AC-DC Elec.
VICTORITE 1	Corrosion, heat, abrasion	Saw teeth, carbon scrapers, wire guides, rocker arms, steel mill applications	Acety. AC-DC Elec.
VICTORITE 6	Red heat, impact, corrosion and abrasion	Blanking, forming and trimming dies, cams, hot punches, pump shafts	Acety. AC-DC Elec.
VICTORITE 12	Heat, abrasion, impact	Saw blade inserts and other critical applications	Acety. AC-DC Elec.
VICTORITE CARBON ARC	High abrasion, thin deposit	Plowshares, lister shares, sweeps	Carb. arc Acety.
VICTORALLOY	Abrasion, severe impact	Tractor rollers, dredge pump impellers, bucket lips and teeth, rock crushers, steel mill wobblers, roll crushers	Acety. AC-DC Elec.
VICTORALLOY #1	High abrasion, medium impact	Bucket lips, rock crushers, Muller tires, gyratories	Acety. AC-DC Elec.
VICTORALLOY "A"	Angular shock, extreme impact, build-up	Clutch parts, gears, crusher plates, gyratory mantles, build-up for hardfacing	AC-DC Elec. only
VICTORALLOY "B"	Heavy impact, moderate abrasion	Tractor rollers and sprockets, shovel pads, plates, idlers, etc.	AC-DC Elec. only
VICTORALLOY "C"	High abrasion, moderate shock and impact	Tractor grousers, pressure rolls, crusher segments, roll crusher teeth	AC-DC Elec. only

Also VICTOR Bulk Metals, VICTORITE Plow Point Bars, and VICTOR Super-Titan Blasting Nozzles

For Automatic Application

THIS TYPE	FOR THESE CONDITIONS	ON THIS KIND OF EQUIPMENT
VA #1	Abrasion, medium impact	Crusher rolls, crushers, gyratory crushers
VA #2	Abrasion, impact, Multi-pass application	Steel mill applications
VA #3	Abrasion, light impact	Mill guides, crushers, dredge bushings
VA #4	Multiple layer build-up	Tractor rails, crane wheels, general build-up
VA #5	Heavy impact, abrasion	Tractor rollers, idlers, mine car wheels, sheave wheels
VA #6	Medium abrasion, high impact	Crane wheels, drums, roll necks
VA #7	Abrasion, high impact	Build-up for hardfacing
VA #8	Abrasion, medium impact	Dozer bits, roll crushers, scraper blades
VT #60	Extreme abrasion	Tool joints, grader blades, scraper blades, augers

VICTOR EQUIPMENT COMPANY

ALLOY ROD AND METAL DIVISION

11440 So. Alameda St. • Los Angeles 59

(Also Mfrs. of welding & cutting equipment, blasting nozzles)

844 Folsom St., San Francisco 7 3821 Santa Fe Ave., Los Angeles 58

H-11

*

...is a Johnson-March Engineered Dust Control System!

Wherever dust becomes airborne in a rock crushing plant it causes accident and health hazards, equipment damage and a serious plant and community nuisance.

That's why Johnson-March engineered systems are designed to stop dust at the source . . . at primary and secondary crushers, conveyors, elevators, screens, loading and unloading bins and wherever dust occurs . . . before it becomes airborne.

No ducts, fans or other cumbersome equipment. Easy to install, and economical to operate. Cost averages only 1/10 that of other dust handling systems.

Johnson-March engineers will be glad to analyze your dust problems and recommend a system engineered to your specific requirements.

If you have a stack dust problem, write for information about the Liquid Precipitator "Multiple-Action" Scrubber—the most efficient unit yet developed for removing dust from stack discharged gases.

*Actual unretouched photos taken before and after installation of a Johnson-March system at a large Eastern Rock Crushing Plant.

Johnson March

Dust Control Engineering

DEPT. RP, 1724 CHESTNUT STREET, PHILADELPHIA 3, PA.

1 yd. Jaeger Load-Plus easily loads biggest trucks

This loader gets its chin up

Higher: 8′2″ under lip, 10′4″ under hinge
Farther: 24″ reach — Faster: in only 4½ seconds

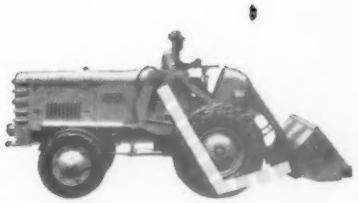
Count how many times a day a loader dumps. That's the multiple of the time saved with this high-reaching, fast-dumping Jaeger Load-Plus. By every measurement of clearance, reach, hoisting speed and clean dumping action it out-performs and out-produces any other loader in its class.

From "carry" position it takes only 4½ seconds to reach maximum dumping height. Trigger-fast bucket control is provided by a separate hydraulic pump and double-acting rams. The large capacity of this pump enables your operator to control bucket loads up to 5000 lbs. with finger-tip ease, dump fast or slow, and place loads anywhere he wants them.

Maximum dumping angle of 50°, and flared 76″ wide bucket lip (extends beyond tires) insure faster, cleaner discharge than ever before. You can also shag or rack the bucket to scour out gumbo or other sticky materials.

A float valve (standard equipment) lets you throw the bucket control into neutral for floating-bucket cleanup work around stock piles, or to clean gutters and pavements without cutting into the surface.

Have your Jaeger distributor show you a Load-Plus at work — or ask us for Catalog L100-3.



Load increases traction because it's centered on the driven front wheels. Hoisting crowds bucket 13″ deeper into pile.

Turns in only 14 ft. radius with power-steered rear axle. 5 speeds to 28.2 mph reverse, 18.7 forward.

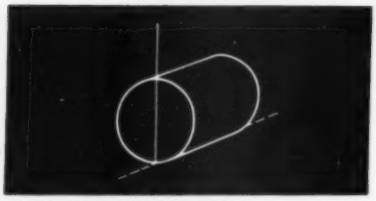
THE JAEGER MACHINE COMPANY

603 Dublin Avenue, Columbus 16, Ohio

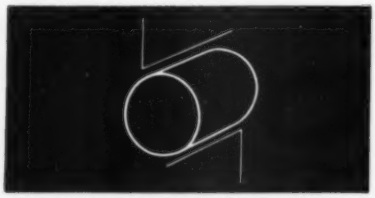
AIR COMPRESSORS • PUMPS • CONCRETE MIXERS • TRUCK MIXERS • PAVING MACHINES

Rollways ROLL right because they're MADE right

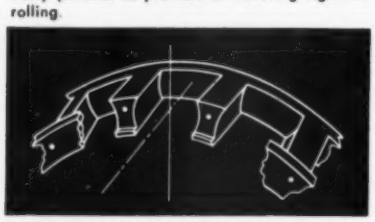
RIGHT ANGLE DESIGN
increases bearing efficiency



RIGHT-ANGLE ROLLER ENDS . . . precisely square to avoid end rub, oscillation and side-shock.



RIGHT-ANGLE BEARING SURFACE . . . precisely parallel to promote unwavering rightline rolling.



RIGHT-ANGLE SEPARATOR SLOTS . . . precisely machined to prevent roller skew, slide and uneven wear.

Line for line and surface for surface, each maximum-load type Rollway Bearing is a striking example of right-angle trueness. The straight, solid cylindrical rollers provide maximum contact area in any given dimension. You get full load-carrying capacity and greater ability to absorb shocks, vibration and overload.

The net result is smoother running, longer life, reduced service cost, and less down-time due to bearings.

ROLLWAY BEARING CO., INC.
SYRACUSE 4, N. Y.

- Our engineers will gladly work with you on your bearing problems. Confidential consultation. No charge — no obligation.

Rollway Bearing replacements are available through authorized distributors in principal cities. Consult your classified phone directory.

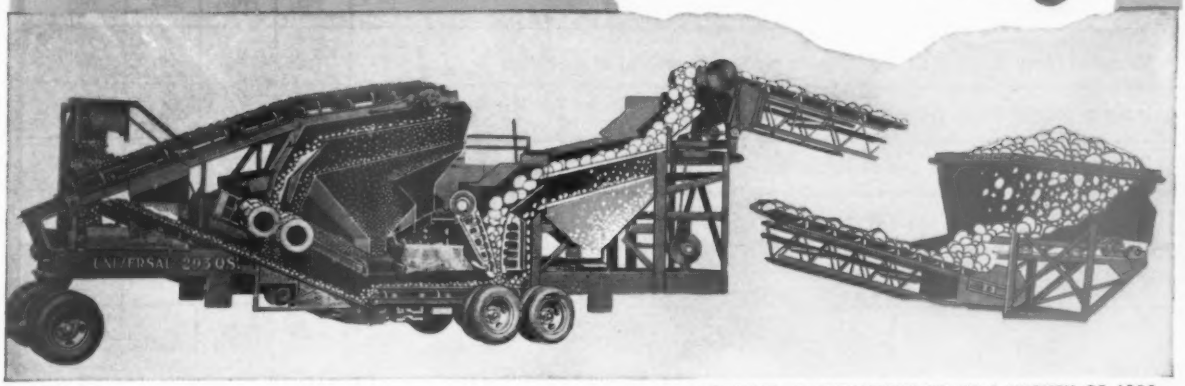
ROLLWAY
BEARINGS
COMPLETE LINE OF RADIAL AND THRUST CYLINDRICAL ROLLER BEARINGS

SALES OFFICES: Boston • Detroit • Milwaukee • Syracuse • Chicago • Houston • Philadelphia • Toronto • Cleveland • Los Angeles • Pittsburgh • San Francisco • Seattle

FREE AGGREGATE

FOR BIGGER PAYLOADS
MORE PRODUCT COMBINATIONS

The UNIVERSAL 293QS TwinDual Gravel King

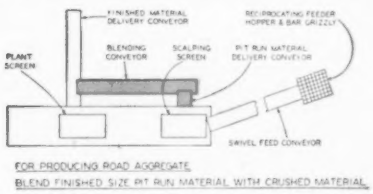


Universal gives you more tons per hour at less cost per ton with three full stages of crushing and **two screens** in the 293QS TwinDual Gravel King.

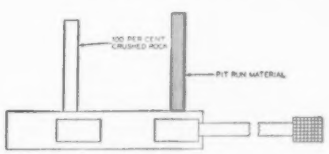
Pit run material of finished size is pre-screened and does not pass through the main plant. You get **Free Aggregate** which increases over-all production 50 to 100%. The main plant screen sizes crushed material only and is not burdened with natural finish. Top crushing capacity is provided by Universal's exclusive TwinDual Method which divides the crushing load between three crushing stages: First stage - 18" x 24" or 20" x 36" Jaw Crushers, Second and Third stages - 24" or 30" TwinDual Roll Crushers.

For those big jobs requiring volume production and a variety of finished product combinations, investigate the 293QS TwinDual Gravel King. Complete details in Bulletin No. U501. Write for your copy.

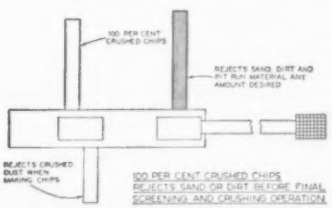
PRODUCT COMBINATIONS TO FIT A VARIETY OF JOBS



FOR PRODUCING ROAD AGGREGATE
BLEND FINISHED SIZE PIT RUN MATERIAL WITH CRUSHED MATERIAL



FOR PRODUCING 2 PRODUCTS SIMULTANEOUSLY
100 PER CENT CRUSHED ROCK AND SIZED PIT RUN MATERIAL



100 PER CENT CRUSHED CHIPS
REJECTS SAND OR DIRT BEFORE FINAL SCREENING AND CRUSHING OPERATION

UNIVERSAL ENGINEERING CORP. *Subsidiary of* **PETTIBONE MULLIKEN CORP.**

617 C Avenue N.W., Cedar Rapids, Iowa
Phone 7105

4700 W. Division St., Chicago 51, Illinois
Phone SPaulding 2-9300

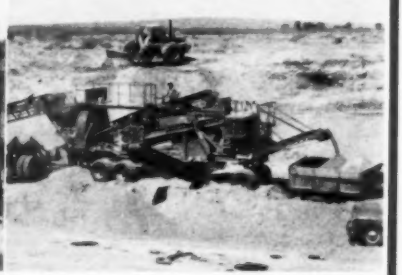
Compare...Then you'll specify AUSTIN-WESTERN for your crushing and screening plant!

HERE ARE A FEW TYPICAL REASONS WHY IT WILL PAY YOU TO **COMPARE** BEFORE YOU BUY!

COMPARE ...	A-W	Make "X"	Make "Y"	Make "Z"
Steel plate crusher frame for high strength without weight of cast steel frame.	Yes	No	Yes	No
Machined steel toggle plate for absolute protection instead of cast iron	Yes	No	No	No
Inclined positive-throw type vibrating screen	Yes	Yes	No	Yes
Dustproof and watertight brakes on outside of wheels	Yes	No	Yes	No
All bearings of anti-friction type	Yes	Yes	Yes	Yes
Single source for wide range of complete stationary or portable plants, crushers, matching screens, elevators, conveyors and bins	Yes	Yes	No	No
TOTAL	100%	50%	50%	33⅓%

"61" compact, lightweight and readily portable. Designed for low cost, fast output where extreme accuracy to size is not required.

"101" Newly designed plant with 10" x 36" roller bearing jaw crusher, 30" x 20" roller bearing roll crusher, 30" conveyors and 4' x 12' inclined positive throw type screen.



"201" New Austin-Western plant to produce especially large amounts of ¾" and smaller product. 10" x 24" jaw crusher, 24" x 16" roll crusher; 3' x 10' vibrating screen, and 24" conveyors.

Before you buy any crushing and screening plant, we urge you to *compare* carefully specific design and construction features. If you do so, we are confident that you will prove conclusively that Austin-Western plants are designed and constructed to out-perform and outlast all other makes.

● *For detailed information about any of these points or copies of our latest catalogs, please write: Construction Equipment Division, Baldwin-Lima-Hamilton Corporation, Lima, Ohio, or distributor nearest you.*

DISTRIBUTORS IN ALL PRINCIPAL CITIES OF THE WORLD

Austin-Western
CRUSHING, SCREENING and WASHING EQUIPMENT

BALDWIN BLH LIMA-HAMILTON
Construction Equipment Division

BALDWIN-LIMA-HAMILTON CORPORATION
Construction Equipment Division
LIMA, OHIO, U.S.A.

"Here's Good News for us Blasters..."

We have always claimed that Primacord is not affected by stray currents and cannot be set off by friction, sparks or ordinary shock. But lightning! . . . no one knew what lightning would do . . . until now!

The incident took place on a pipe line job in Kentucky. Primacord branch lines were hooked up to the trunk, but the detonator had not been attached. The crew left the job when the thunderstorm warning came – and when they returned they discovered that lightning had struck the Primacord in two places, but had failed to detonate it. About six feet of trunk line was gone, and the free ends appeared to have been melted off. The branch line Primacord from four holes, previously tied into the trunk, were also burned off to the collars of the holes. Another burned out section of the trunk line, about two feet long, was found twelve feet away.

New lengths of Primacord were tied onto the trunk and branch lines, and the blast was shot when all was ready.

This is good news for blasters – especially during the thunderstorm season, or where high voltage electrical equipment is on the job.

P-16

Ask your explosives supplier or write for further facts to

THE ENSIGN-BICKFORD COMPANY
Simsbury, Connecticut
Also Safety Fuse since 1836

PRIMACORD® *detonating fuse*

PROVED and APPROVED

now—

a 4-WHEEL DRIVE Excavator-Loader with *plus* features for *plus* performance

TRACTOMOTIVE TL-12 TRACTO LOADER

4-WHEEL DRIVE for excellent traction — excavating or loading — even under adverse ground conditions . . .

PLUS HYDRAULIC TORQUE CONVERTER DRIVE for smoother, faster operation. No ramming or clutching, no engine stalling . . . easier maneuvering, snappy bucket action!

PLUS CLUTCH-TYPE TRANSMISSION Eliminates most shifting. Operator simply pushes a lever to go forward, pulls it back for reverse. He can work all day without shifting gears on short-haul jobs!

PLUS REAR-WHEEL POWER STEERING This advantage together with all-wheel drive means easy steering and maneuvering under all operating conditions.

PLUS NEW, DYNAMIC ALLIS-CHALMERS POWER-CRATER ENGINE Gives you high-octane performance on regular gasoline.

• • •

Yes, here's 4-wheel drive PLUS . . . PLUS all the advantages Tractomotive offers you in its famous TL-10 Tracto-Loader — the outstanding performer on bulk material handling. Choose the model that fits your needs.

Wire, write or call for a demonstration NOW!

POWER-CRATER is an Allis-Chalmers trademark

Weight: 12,000 lb.
Bucket Capacity: 1 cu. yd.
Speeds — 4 forward, to 20 mph . . . 4 reverse, to 25 mph
Brake Hp. — 63

MODEL TL-10 for all types of bulk material handling . . . with short, 11-ft. turning radius, torque converter drive, clutch-type transmission and Allis-Chalmers POWER-CRATER engine. ¾ cu. yd. bucket, weight 11,400 lb., 63 brake hp.

See your nearest Allis-Chalmers Industrial Tractor Dealer

TRACTOMOTIVE

TRACTOMOTIVE CORPORATION, DEERFIELD, ILLINOIS

Tracto-Loaders • Tracto-Shovels, Side Booms and Hydraulic Rippers for Allis-Chalmers Crawler Tractors • Loader and Shoulder Maintainer for Allis-Chalmers "D" Motor Grader

if you want lower V-Belt costs—

When a V-Belt bends, you can feel its sides change shape.

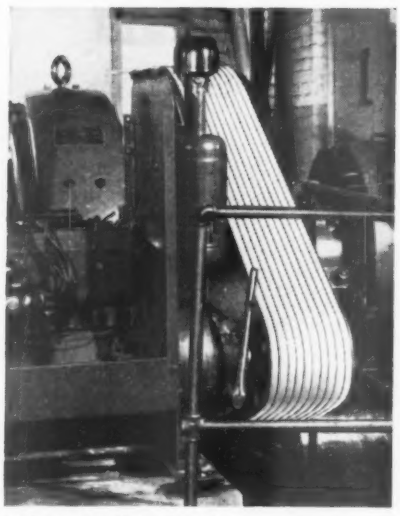
just make this simple test

Take *any* V-belt that has *straight* sides (Fig. 1). Bend that V-belt while you grip its sides with your fingers. You will *feel* the sides *bulge out* (Fig. 1-A). Clearly, that out-bulge forces the belt to press *unevenly* against the V-pulley—and this *concentrates* wear at the points shown by arrows (Fig. 1-A).

Now bend a Gates Vulco Rope with CONCAVE SIDES (Fig. 2)

(U.S. PAT. NO. 1813698)

Instead of *bulging*, the precisely engineered CONCAVE SIDES merely *fill out* and become perfectly straight. This belt, when bent, *precisely fits* its sheave groove (Fig. 2-A). The sides of the Gates Vulco Rope press *evenly* against the V-pulley. Therefore, wear is distributed *uniformly* across the *full face* of this belt —resulting in *longer* belt life and *lower* belt *costs* for you!



Typical Gates Vulco Rope Drive —the Gates V-Belts are built with Concave Sides to insure longer belt wear.

When you buy V-belts, be sure to get the V-belt with the Concave Sides—the Gates Vulco Rope!

Gates VULCO ROPE DRIVES

REG U S PAT OFF

Gates Engineering Offices and Jobber Stocks are located in all industrial centers of the United States and Canada, and in 70 other countries throughout the world.

THE GATES RUBBER COMPANY
DENVER, U.S.A.

CS-543

Ready Mix Concrete Operator Says:*

"Increased Our Business 25% with Motorola 2-way Radio!"

Dispatchers "right arm" is Motorola 2-Way Radio, which provides instant control over all trucks, continuous truck-to-office communications.

Greater control of operations leads to more Profits with

Motorola 2-way Radio

a practical new tool in Ready Mix Concrete

"We're now operating 20 trucks to capacity as against 16 last year —and to us that's good proof that Motorola 2-Way radio is a business getter as well as a money-maker on the job."

From similar reports it's clear that Motorola 2-way radio is enabling many ready mix operators to brush off headaches by the dozen. It establishes dispatcher control over most situations that would ordinarily develop into sure losses, quick re-routing to maintain close schedules, fast relief in breakdowns, better control of load estimates and deliveries, fewer unforeseen overtime penalties . . . all these factors are promptly controllable with Motorola 2-way radio.

Write or phone us at once for a Motorola engineer. He'll be glad to explain how for about $1.00 per day, per truck, you can greatly increase your profits. He'll tell you how Motorola, the largest *exclusively-radio* organization, will give you a firm contract for unexcelled *Motorola* service and maintenance. He'll tell you how Motorola makes it pay for you to own and operate your own 2-way radio system.

*Name in our files.

Motorola Communications & Electronics, Inc.

A SUBSIDIARY OF MOTOROLA, INC.

4501 W. Augusta, Chicago 51, Ill. • Rogers Majestic Electronics Ltd., Toronto, Canada

national Motorola RADIO COMMUNICATIONS service

● *There's this about Erie Strayer Equipment...*

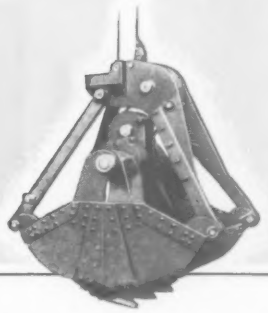
EVERY UNIT IS A CUSTOM-BUILT PACKAGE MADE FROM STANDARD, PRODUCTION PARTS

This means a lot both in immediate and long-range benefits. Equipment engineered especially for your particular needs is bound to give you more efficiency. That's the purpose of engineering. And being made from standard parts means quick service on replacements when you need them. Keeps your equipment going—avoids costly down time.

Since 1912, owners of Erie Strayer bins, batching and mixing equipment have enjoyed these money-saving features. In today's highly competitive market, equipment that cuts cost goes a long way toward keeping you in the running, when you have to "sharpen your pencil."

Instead of bidding against these advantages why not let them bid for you! Before you decide, see Erie Strayer.

WRITE FOR BULLETIN AP-1



Erie Clamshell Buckets give you longer service and lower upkeep

1. Rigid, one-piece, welded head prevents wobbling, reduces wear.
2. Lever arm type bucket delivers greater closing power to scoops.
3. Low headroom means more payload per hour. Easier to maneuver.

For more about Erie Buckets, write for Booklet 2L2.

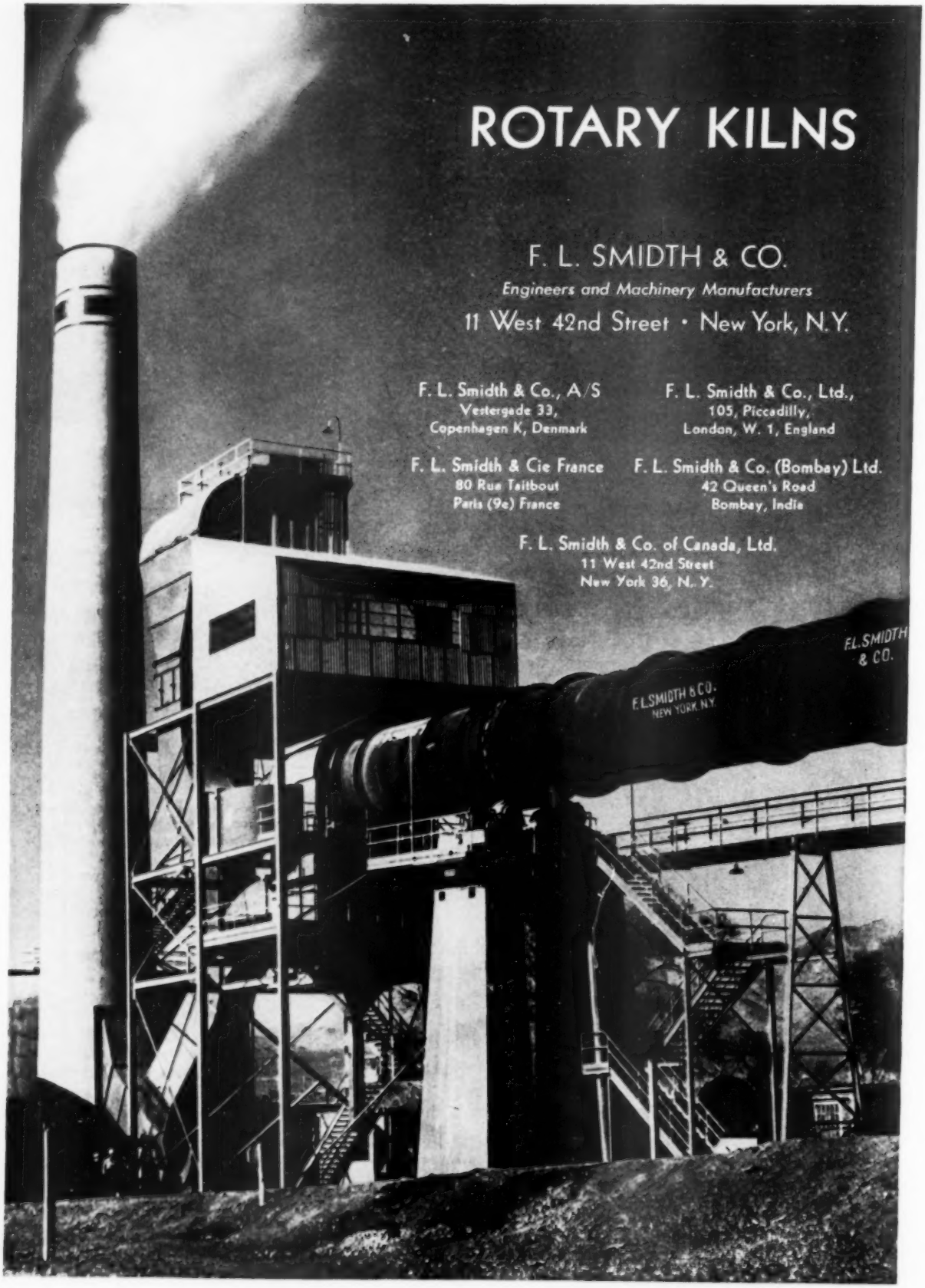
Cable Address: EXIMPORT *For Booklets, Address Dept. P84*

FORMERLY ERIE STEEL CONSTRUCTION COMPANY

ERIE STRAYER CO.

SAME PEOPLE • SAME PRODUCTS • JUST A NEW NAME

484 GEIST ROAD **ERIE, PENNSYLVANIA**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F.L.SMIDTH & CO.
NEW YORK, N.Y.

What's Happening

August 1954

Heavy construction awards, nationally, totaled $6,190,768,000 for the first 24 weeks of 1954, as reported by ENGINEERING NEWS-RECORD. This represented a 14 percent decrease from the all-time high of $7,171,489,000 for the same weeks of 1953, but was still said to be the third highest volume of contract dollars on record.

The concrete batching plant at The Dallas Dam powerhouse project recently collapsed, reportedly from structural failure. Although no injuries were reported, damage was estimated at $250,000. The accident was expected to delay construction of the powerhouse for about two months, resulting in about 1200 men temporarily out of work. The batching plant had a capacity of 250 cu. yd. per hour.

Delivery by air is a new wrinkle in the concrete block industry—and also for Harold Conklin, owner of a concrete block plant at Ephrata, Wash. Mr. Conklin recently received a "hurry-up" order from an Othello, Wash., contractor who asked Mr. Conklin to meet his plane at the Ephrata Air Base with a shipment of block. The contractor loaded his plane with the block and reportedly made a successful return flight to Othello.

Uranium deposits, discovered in a mica mine near Barnesville, Ga., are "better than some" currently being mined and sold, according to the Atomic Energy Commission. The ore is said to contain the second known deposit in the United States of a rare material known as soddite. The location of the ore in a pegmatite vein will probably, however, prevent immediate access to it. According to an A.E.C. spokesman, uranium is not now being mined anywhere in the country from rock strata like the one at Barnesville.

According to the Federal Reserve Board, the immediate future looks good for the construction industry which is now enjoying its biggest boom in history. Money spent on all types of construction reportedly will total a record $37,000,000,000 this year at the present rate of activity. The reasons for the record activity, according to the board, are: Stable or declining construction costs with stiffer competition and greater efficiency, and large savings and easier Federal Reserve credit policies, resulting in a greater availability of funds for construction and mortgage loans.

Experimental storage of fuel oil in an abandoned slate quarry at Wind Gap, Penn., is being pioneered by Esso Standard Oil Co. The pit, owned by Colonial Slate Quarry, reportedly is over 250 ft. deep, with an approximate 3,000,000-bbl. capacity. It will store oil pumped from a refinery through a pipeline during summer months, serving as a reservoir to release oil for the heavy home-heating season. Another nearby pit will serve as a water reservoir. The operation calls for pumping of water into the oil-storage pit as the oil is pumped out, and vice versa. A total of 240 3-ton steel pontoons have been placed on the quarry surface to form a cover to protect the oil from evaporation, dust and animal life. The cover, sealed by a type of rubber clamped to the quarry wall and the pontoons, reportedly will rise and fall only one or two feet. If the experiment is successful, Esso Standard plans to use a number of other abandoned quarries for oil-storage purposes.

WHAT'S HAPPENING

Denton County, Texas, officials are conducting experiments on construction of salt-stabilized roads. One experiment will feature a mixture of salt, sand and gravel, and another will be a test of salt and sand mixture.

Lyman-Richey Sand and Gravel Co.'s sand and gravel operation near Fremont, Neb., seems to be producing more than just sand and gravel, namely, catfish—or is it fish "yarns?" A 74-yr.-old angler reportedly landed a 34½-in. catfish weighing over 14 lb., by using a 10-lb. test single filament line on a spinning reel—and hauling it in in 30 min.

A stethoscope-type device which can detect otherwise unpredictable rock slides during tunnel construction has been developed by Liberty Mutual Life Insurance Co. of Boston. The device reportedly can tell where danger is developing in time for engineers to prevent calamity. Long before the actual fall occurs, as explained by Liberty Mutual, the molecules in the rock produce a noise as they slide by one another, but are not audible until magnified about a million times. The new device magnifies this noise which can either be recorded on a continuous tape like a seismograph recording, or can be heard with a pair of earphones. Such a device might prove useful in limestone mines or quarries where there is danger of slides and slips.

A continuous mining machine that uses a pair of hard-hitting, vibrating hammers to knock down coal from the face of a mine has been invented by a U. S. Steel Corp. executive and is now being placed on the market for general use, as recently reported in THE WALL STREET JOURNAL. The machine in normal operation, with a crew of three or four men, reportedly mines and loads 120 to 250 tons of coal in each mining shift. Its average is reported at about 40 tons for each man working one shift at the face of the coal, or about 15 tons for each man in the mine, which is about 2½ times as much coal per man under conventional mining methods. Mounted on crawler treads, the machine is 4½ ft. high 6½ ft. wide and, including the conveyor, is 30 ft. long and weighs 23 tons. Counting auxiliary equipment, the cost of the machine is estimated between $125,000 and $130,000. The machine was described as "very flexible" and adaptable to various mining conditions.

A contract award for nearly $60,000,000 for a water-development and power project in the Snowy Mountains of southeast Australia was recently awarded to a group of American contractors, consisting of Henry Kaiser Engineers Div. of Henry J. Kaiser Co., as the sponsor; Walsh Construction Co.; Perini & Son, Inc.; Raymond Concrete Pile Co.; General Construction Co.; Bates & Rogers Construction Corp.; and The Arthur A. Johnson Corp. The project is a plan to impound the waters of the Snowy River and main tributaries and divert them through long tunnels under the dividing mountain range to produce hydro-electric power and to irrigate arid lands. Total work involved includes the construction of seven major dams, over 80 mi. of large-diameter tunnel, 17 power stations, more than 400 mi. of aquaducts, and a number of subsidiary works. The award to the American group covers the construction of a 14-mi., 26-ft.-dia. concrete-lined tunnel; a 100-ft. high, 260-ft. long diversion dam, and a concrete arch dam, 290 ft. high and 715 ft. long. Design was done by the U. S. Bureau of Reclamation, under agreement between the Commonwealth of Australia and the U. S. Department of State.

THE EDITORS

SMIDTH....

Machinery For Cement - Lime - Ores

F. L. SMIDTH & CO. Manufacture the following Complete Line of Modern Machinery for Cement, Lime and Allied Materials, the Sintering of Ores, etc.

UNIDAN multi-compartment grinding mill.
KOMINUTER for wet and dry grinding.
BALLMILL for granulating.
TUBEMILL for wet and dry pulverizing.
TRIX for grading wet granulated material
TIRAX MILL for drying and grinding
CYLPEBS metallic grinding bodies.
DRAGPEB metal lining for pulverizers.
SILEX flint liners for pulverizers.
AIR SEPARATORS and Cyclones.
AGITATORS for mixing and storing wet mix.
AIR DISTRIBUTORS for slurry tanks.
WASHMILL for disintegrating and mixing materials in water.

ROTARY KILNS for cement, lime, ores, etc.
UNAX KILNS, with integral cooler.
ROTARY KILNS—Sintering and roasting.
PRE-HEATERS for rotary kilns.
UNAX COOLERS, cooling drums on kiln.
UNAX PRE-COOLER.
UNAX GRATE COOLER, air quenching.
COOLERS, Cement, Ores, etc.
CHAIN SYSTEM for wet kilns.
HEAT EXCHANGERS for dry kilns.
KILN CONTROL, electrical.
GAS ANALYZER, electrical.
KILN EQUIPMENT, fans, hoods, dampers, spouts, airseals, dust chambers, multiple gas discharge.

FLUXO PACKER for filling bags.
EXBINER for discharging bulk cement.
EXTRACTORS, cement from silos.
SKIPULTER shaker conveyor
PNEUMATIC FEEDERS.
SLURRY FEEDERS for kilns and mills.
CRADLE FEEDERS for coal, rock, clinker.
TABLE FEEDERS for coal, rock, clinker.
COAL FEEDERS for rotary kilns.
COAL BURNERS for rotary kilns.
GAS BURNERS for rotary kilns.
OIL BURNING EQUIPMENT for kilns.
SYMETRO Drive, speed reduction units.
FLOURMETER for determining micron sizes in finely ground cement, etc.

Plant Engineering

F. L. Smidth & Co. are also engineer specialists in designing and equipping factories for making Portland cement and other allied materials, having devoted their efforts along these lines for a period of over half a century.

Engineering services include all stages of the project from the preliminary investigation of the site and raw material deposits, chemical and physical tests of the raw materials and finished product, to all necessary drawings and specifications for erecting and equipping all departments of the plant, including also the electrical engineering.

Modernization

This service applies equally well to complete new plants or any special department of a plant—to revisions or conversions of existing plants—making standard Portland cement, slag cements, white cement, or for making special high early strength cements.

For Smidth Machinery apply to:

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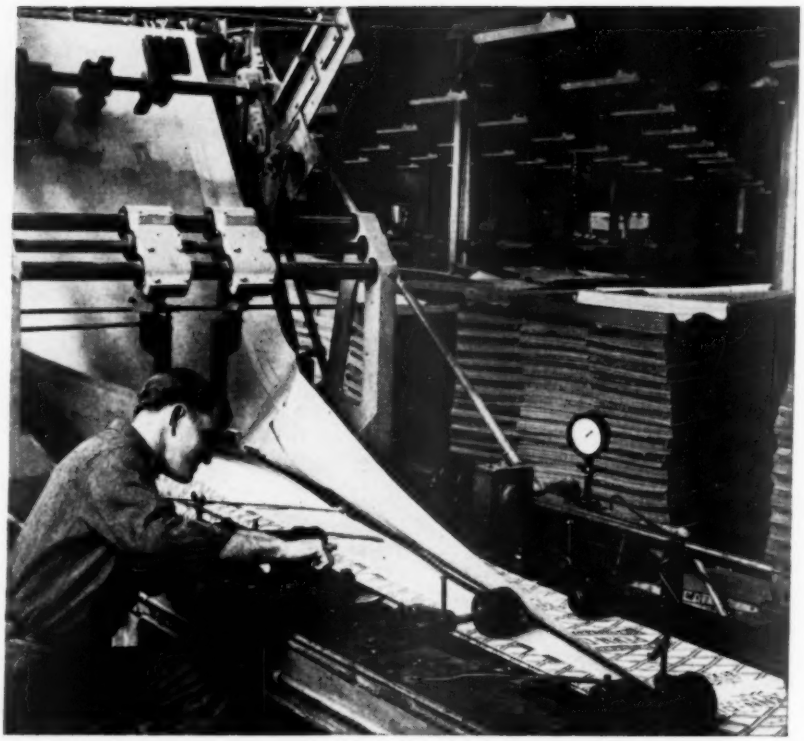
No. 4 of a series

How Bemis makes GOOD multiwall bags for you



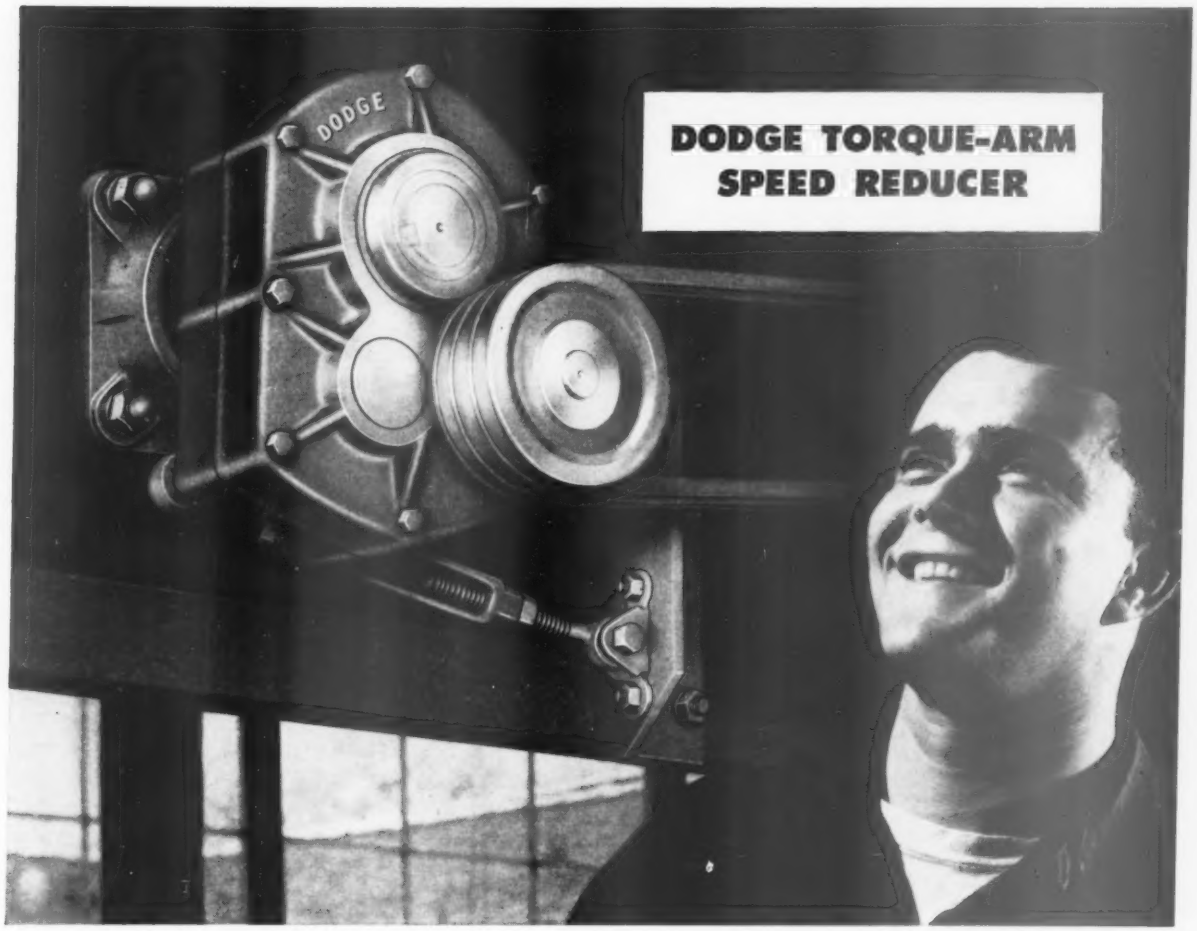
Herman Johnson, who is in charge of this big tuber at the Bemis Multiwall Plant in Peoria, joined Bemis in the tubing department nine years ago and worked up to his present capacity. His job is one of the most important in a multiwall plant.

Experienced Hands Run Our Tubers!

Bemis

General Offices—St. Louis 2, Mo.
Sales Offices in Principal Cities

Tubers—the big machines that fold and paste the multiple kraft plies—are the heart of multiwall bag making. Running, they look pretty automatic. But you don't learn to run a tuber by reading an instruction manual. It takes long experience, knowing eyes, deft hands, to keep the plies properly nested and paste properly applied . . . and to control the many other factors that affect the performance of the finished bag. We've been making multiwalls for twenty-seven years . . . so there's plenty of bag-making experience in our twelve multiwall plants strategically located coast to coast.



Costs less - Delivers more!

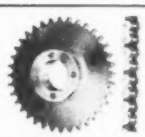
Savings up to 33% . . . efficiency up to 97% . . . are yours with this new and better kind of speed reducer. Proved in tens of thousands of installations, in all types of industry!

This reducer is mounted directly on the driven shaft. No foundation, no flexible couplings, no sliding base required. No lining up difficulties. The torque-arm, fastened to any fixed object, anchors the reducer. Unit is driven through any V-belt drive. Stock Taper-Lock Sheaves prescribed for each job. Tri-Matic Overload Release and Backstop are available if desired.

Torque-Arm Speed Reducers are sold from Distributor's stocks—in single reduction and double reduction series—with capacities from 1 to 43 hp and output speeds from 12 to 330 rpm. Standardize on this modern idea in speed reduction—it saves you money.

DODGE MANUFACTURING CORPORATION, 2600 Union St., Mishawaka, Ind.

DODGE
of Mishawaka, Ind.


TAPER-LOCK SPROCKETS AND DODGE ROLLER CHAIN


TAPER-LOCK SHEAVES


DODGE-TIMKEN PILLOW BLOCKS

Call the Transmissioneer, your local Dodge Distributor. Factory trained by Dodge, he can give you valuable assistance on new, cost-saving methods. Look for his name under "Power Transmission Machinery" in your classified telephone directory, or write us.

GET TRUCK PAYLOADS!

with the DEMPSTER DIGGSTER® GRD-101

The two photos above show some very important advantages you get when you use a Dempster-Diggster GRD-101. Photo directly above shows you why you have no truck shock with a Dempster-Diggster. You can lay bucket in truck body, trip latch and pull bucket up off load. Photo at right above shows you why you get a truck payload with a Dempster-Diggster . . . and how natural and easy it is to do so. This truck is now loaded to maximum heaped capacity, yet Dempster-Diggster has ample clearance. The dumping height is 9'6" and the digging height is approximately 15 feet. This enables the Dempster-Diggster to work with high dump equipment.

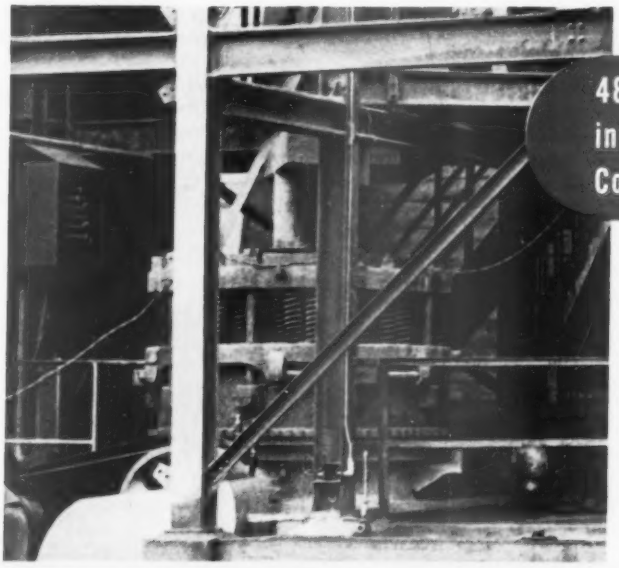
Other very important features of the new Dempster-Diggster GRD-101 include: AN EXCAVATOR THAT NEEDS NO WHEEL TRACTION (loading of bucket is accomplished by the exclusive Hydraulic Crowd and Hoist Action of the Dempster-Diggster) . . . TRUCK-SPEED MOBILITY TO AND FROM JOBS . . . AUTOMATIC BUCKET TRIP . . . MINIMUM TURNING RADIUS . . . THE SHOVEL WITH TORQUE CONVERTER . . . HYDRAULIC STEERING. Here's a shovel that gives you extra speed on the job and to and from jobs that means extra profits to you! Pound for pound, dollar for dollar, the Dempster-Diggster GRD-101 will out-dig and out-load any other available competing machine in tough going! Let us prove that statement! Write for complete information. Manufactured by Dempster Brothers, Inc.

DEMPSTER BROTHERS

DEMPSTER BROTHERS, 384 N. Knox, Knoxville 17, Tennessee

TELSMITH®

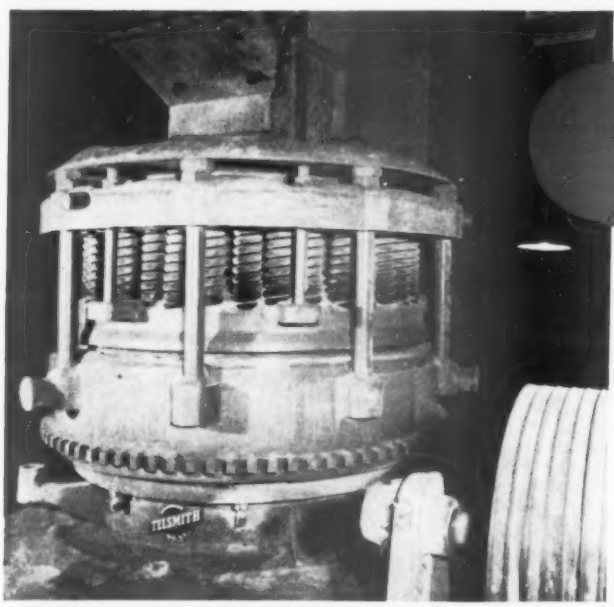
®Gyraspheres in CEMENT MILLS



48-FC Telsmith Fine Crushing Gyrasphere in the British Columbia Portland Cement Company Limited plant at Victoria, B. C.

The British Columbia Portland Cement Company Limited wanted to deliver a finer feed to their cement grinding mills—and thus increase output. To do it, they installed early in 1952, a Telsmith 48 Fine Crushing Gyrasphere to crush cement clinker from 2″ to minus 3/8″.

They are thoroughly satisfied!



48-S Telsmith Standard Gyrasphere in Kosmos Portland Cement Co. plant at Kosmosdale, Kentucky.

The Kosmos Portland Cement Co. has operated their Telsmith 48-S Gyrasphere 24 hours a day since July, 1951—crushing 100 tons per hour of 220 to 275-degree limestone from 4 1/2″ down to 5/8″.

They are thoroughly satisfied!

Send for Bulletin No. 274

Y-13

SMITH ENGINEERING WORKS, 508 E. CAPITOL DRIVE, MILWAUKEE 12, WISCONSIN

Cable Address: Sengworks, Milwaukee

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Marens Eqpt. Co., New Hudson, Mich. • Rish Eqpt. Co., Cincinnati 14, & Portsmouth, Ohio—Charleston 22, & Clarksburg, W. Va.—Roanoke 7, & Richmond 10, Va. Robert S. Bailey, 816 W. 5th St., Los Angeles 17, Calif. • Mines Eng. & Eqpt. Co., San Francisco 4, Calif. • Clyde Eqpt. Co., Portland 9, Ore., & Seattle 4, Wash.

Have you a dust recovery problem?

Bring it to WESTERN PRECIPITATION

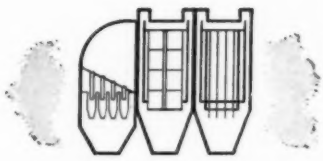
... The Only Organization With Years Of "Know-How" In BOTH *Electrical* And *Mechanical* Recovery Methods!

If you have any kind of a suspension-recovery problem—whether dust, fly ash, fume, fog or mists—it will pay you to bring it to the leading organization in the field ... WESTERN PRECIPITATION CORPORATION. Western Precipitation not only pioneered, over 44 years ago, the first commercial application of the now-famous COTTRELL Electrical Precipitators, but also has been a leader for many years in the *mechanical* recovery field with its widely-accepted MULTICLONE Collectors.

Result:

Western Precipitation is unsurpassed in the all-important factor of "know-how" in BOTH the electrical and mechanical fields ... knows from years of first-hand experience whether your particular problem can best be solved by mechanical or electrical methods—*or by a combination of the two* ... can give you a direct and unbiased recommendation on the matter ... and then can provide the complete installation under *one* responsibility, *one* overall performance guarantee, even where Combination Multiclone-Precipitator (CMP) installations are made!

Western Precipitation products and services include ...



COTTRELL

Electrical Precipitators

... the most efficient recovery equipment for high recovery, long life, low maintenance on practically any type of suspensions, wet or dry. COTTRELLS can be designed to handle a few c.f.m. —or millions—with equal ease, and at virtually any operating temperature. Recovery efficiencies closely approach 100% recovery, if desired, with very low draft loss, minimum power costs and negligible labor costs. *By all standards, Western Precipitation COTTRELLS give highest recovery at lowest cost per-year-of-service!*

MULTICLONE

Mechanical Collectors

... the most efficient, most compact, most trouble-free mechanical equipment for recovering suspensions from gases. Because of their unique small-tube design, MULTICLONES are unsurpassed in mechanical recovery efficiencies—require less space, less maintenance, and are far simpler to install. No filters or screens to replace, nothing to burn or cause fire hazards, no high speed moving parts to repair or replace. These and many other advantages make MULTICLONE Collectors the logical choice on installations where mechanical recovery is selected.

CMP UNITS

(Combination Multiclone-Precipitator)

... combine, in *one* compact installation, *both* mechanical and electrical recovery principles so that maximum benefit is obtained from the advantages inherent in each method. The MULTICLONE section centrifugally removes the larger and heavier suspensions (down to a few microns in diameter) ... and the COTTRELL section then electrically removes the very small particles remaining in the gases. Thus, the bulk of the recovery is obtained with relatively low-cost equipment, and the final clean-up is obtained with equipment having unusually high recovery efficiency—approaching theoretically perfect, if desired.

The recovery of suspensions from gases is a highly exact science and every problem is different. Some require mechanical methods—others electrical methods—still others a combination of mechanical and electrical methods in proper balance to meet the individual requirements of each application. No matter what your problem, remember that only Western Precipitation has had years of field experience in BOTH mechanical and electrical methods!

Send for descriptive literature!

Let our experienced engineers study your recovery requirements and make an unbiased recommendation on the equipment best suited to your particular problem. A wire, phone call or letter to our nearest office places this unique "know-how" at your service, without obligation.

WESTERN Precipitation CORPORATION

DESIGNERS AND MANUFACTURERS OF EQUIPMENT FOR COLLECTION OF SUSPENDED MATERIALS FROM GASES & LIQUIDS

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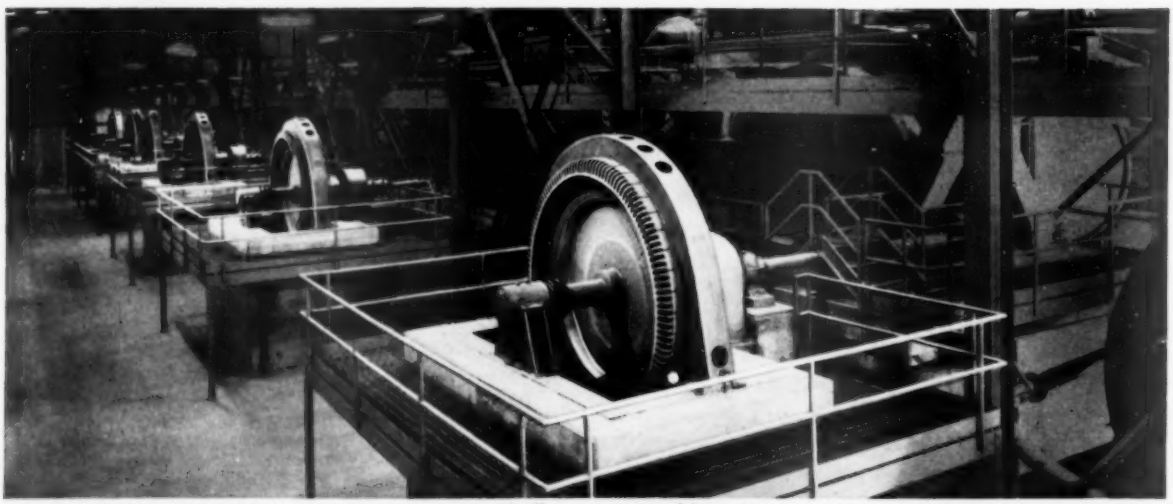
PRECIPITATION CO. OF CANADA, LTD., DOMINION SQ. BLDG., MONTREAL

MULTICLONE—T.M. Reg.

1 ON-THE-SPOT SEPARATION is done on this barge, which floats in a man-made pond near the Bunnell plant. Walking dragline (in background) dumps sand containing coquina shell into bins. These are five of twelve totally enclosed fan-cooled G-E Tri-Clad* gear-motors that keep conveyor loads moving to the screening process—in this corrosive atmosphere.

Lehigh Portland Cement Company's



2 HIGH POWER FACTOR helps plant operate economically. Three of these 700-hp, 180-rpm, 4000-volt synchronous motors drive primary wet ball mills that pulverize raw material; three others grind cement clinker after burning.

3 **KILN-SPEED CONTROL** over wide range is made possible by G-E adjustable-voltage d-c drives. Each kiln uses a 125-hp motor, and an electrically co-ordinated feeder motor.

4 **RELIABLE POWER SUPPLY** for kiln drives includes G-E 1000-kva load-center substation, two G-E synchronous m-g sets, and a-c and d-c control (background).

5 **DEPENDABLE POWER-SWITCHING** is provided by 4160-v metal-clad switchgear in a pressure-ventilated room. Vertical-lift design means you ***see*** when breaker is disconnected.

6 **CONTINUOUS FLOW** of finished cement through packhouse is aided by this G-E Tri-Clad motor driving bagging machine, and gear-motor driving conveyor for bagged cement.

*Reg. trade-mark of General Electric Company.

new plant powered by G-E system

G-E drives help maintain fast, smooth output of coquina-shell Portland cement

To help relieve the prevailing cement shortage in Florida, the Bunnell plant of the Lehigh Portland Cement Company has been completed with a production capacity of 4000 barrels a day. Here, for the first time in the U.S., coquina shell is being used in the manufacture of Portland cement.

In cooperation with F. L. Smidth & Co. engineers, General Electric cement industry application engineers developed a complete electrical system integrated with each plant process to facilitate a smooth-flowing, continuous operation. Each step, carefully linked with an efficient materials-handling system, is powered and controlled by G-E drives. Success of this coordinated planning is evident with today's fast-moving production flow.

REACH PEAK EFFICIENCY THROUGH ELECTRIFICATION

Use G-E engineering aid early in your electrical modernization planning to avoid production bottlenecks, assure optimum output. Contact your G-E Apparatus Sales Office for Bulletin GEA-5748 or write to General Electric, Section 658-13, Schenectady 5, New York.

Engineered Electrical Systems for the Rock Products Industry

GENERAL ELECTRIC

APPROVED

in

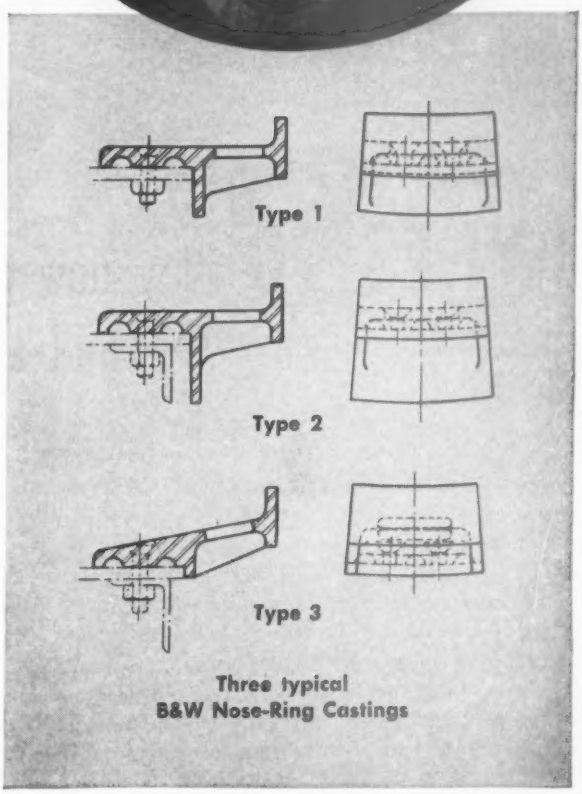
PUNISHING SERVICE

...by More Plants for More Kilns

B&W ALLOY NOSE-RING CASTINGS are establishing a record of fast-growing acceptance by cement plants across the country and abroad. Recent installations have increased the total to 189 sets—or 7062 pieces—now in operation on the discharge end of rotary kilns in leading cement, lime, and dolomite plants.

Sparking this acceptance trend are important cost-saving features characteristic of these light and strong B&W Castings, resulting in improved kiln performance. These features include:

- Longer brick life and continuous operation by elimination of kiln shell "belling."
- "Feathering-down" of end of kiln shell due to oxidation is overcome, since shell is protected from direct flame.
- Low installation cost, due to small size and light weight of B&W Castings.
- Protective flange on casting permits use of low-alloy steel bolts.
- Spare part inventory reduced as same casting will fit kilns varying up to two feet in diameter.



Three typical
B&W Nose-Ring Castings

Write for Bulletin SDM-12.
The Babcock & Wilcox Company,
Process Equipment Dept.,
Barberton, Ohio.

BABCOCK & WILCOX

S-420

HAYNES 90 alloy now available in tubes and at a MUCH LOWER PRICE

TRADE-MARK

Now you can save even more by hard-facing wearing-parts with HAYNES 90 alloy. This is because HAYNES 90 costs so much less in this new economical tube form. These new tube rods produce sound, uniform deposits that won't crumble or flake off at temperatures up to 1000°F. They provide the same high abrasion, impact, and corrosion resistance—the same dependable protection for your equipment that HAYNES 90 brought to you as a cast rod—and at a much lower price.

For manual hard-facing, HAYNES 90 tube rod comes in convenient 14-in. lengths for easy application with standard metallic-arc welding equipment. For rapid coating of large parts, HAYNES 90 also comes in coils for mechanized hard-facing by the submerged-arc, inert gas, and open-arc methods.

HAYNES 93, HASCROME, and HAYSTELLITE alloys are also available in this economical tube rod form. HAYNES 93 iron-base rod is noted for high abrasion and corrosion resistance . . . HASCROME iron-base rod for high impact resistance . . . and HAYSTELLITE tungsten carbide rod is tops for resistance to severe abrasion.

Your local dealer carries a complete line of HAYNES hard-facing rods. Contact him for complete details. If you don't know the location of your local dealer, write to Haynes Stellite Company, a Division of Union Carbide and Carbon Corporation, Kokomo, Indiana.

See... | Your local Haynes Stellite Dealer

or

Write... | to Haynes Stellite Company

"Haynes," "Hascrome," "Hay-stellite," are registered trade-marks of Union Carbide and Carbon Corporation.

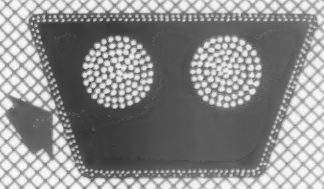
TEXROPE
High Capacity V-BELTS

Resist Oil, Weather, Chemicals

Neoprene is used in *Super-7* High Capacity Belts for extra protection. Result — a strong, tough belt for use inside or out under adverse conditions.

Eliminate Static Accumulations

Super-7 High Capacity Belts are made with a special rubber compound. This permits flow of static electricity throughout the belt to properly grounded sheaves.



40% more Pulling Power

Built for the tight spots where you may want to cut the number of sheave grooves . . . or the tough spots where for some reason ordinary belts fail.

FREE Sound Slidefilms

Valuable information for engineers, operating personnel, maintenance men.

- V-belt drive principles
- V-belt drive selection
- V-belt drive maintenance

Call your nearest Allis-Chalmers Office or *Texrope* Drive Distributor to arrange a showing. Or write Allis-Chalmers, Milwauke 1, Wisconsin. A-4412

Texrope and *Super-7* are Allis-Chalmers trademarks.

A-C ALLIS-CHALMERS

ALLIS-CHALMERS

For Rugged Dependability... It's SECO Vibrating Screens!

Photographed at Dock 8 Installation, Cleveland Slag Co., Jones & Laughlin Steel Plant

Well Known Operator Finds SECO Means BETTER SIZING!

Whether it's for screening and sizing block plant material at the Dock 8 plant . . . or for making eight sizes to meet OHIO State Highway Dept. specifications at the Corrigan-McKinney plant . . . a total of eleven Seco screens are on the job at this modern Cleveland installation. There's a year by year record of dependable performance behind this preference for SECOS by leading slag producers.

Call it smooth operation . . . call it high, accurate production . . . or low maintenance. It's *all* of these in combination that make Seco vibrating screens *first* choice of progressive firms.

HOW ABOUT YOUR SCREENING PROBLEMS?
Take time now to find out how you can increase production and improve accuracy with the right Seco screens on your job!

SECO
TRUE CIRCULAR ACTION
VIBRATING SCREENS

OVER 350 MODELS

Single, Double, Triple and 3½ Decks There's a right Seco for every screening requirement, from Ag-Lime to Rip-Rap. Write for your copy of Seco Catalog #203.

SCREEN EQUIPMENT CO., INC.
Buffalo 25, New York

ANOTHER WAY YOU SAVE WITH FORD *TRIPLE* ECONOMY

T-Series Chassis-Cab models fit any special purpose body from 9 to 19 ft., give you up to 3,800 lbs. more payload than other make 6-wheelers.

New Ford Tandem-Axle Big Jobs

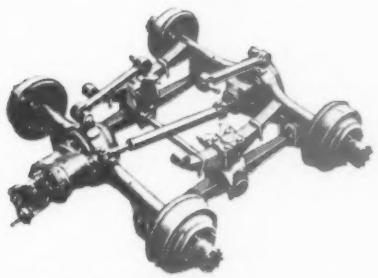
factory-built for low first-cost, smooth operation and long life!

The new Ford T-700 and T-800 BIG JOBS bring famous Ford performance and economy to the extra-heavy-duty field. Ford's mass-production methods keep quality high, first costs low. You get much larger body and payload capacities—up to 95% more on the T-800 than F-800—within legal axle weight limits of most states.

Three new engines up to 170 h.p.—Ford's new LOW-FRICTION, overhead-valve V-8 engines give you low piston speeds, up to 50% longer engine life and more gas-saving power. All-new 138-h.p. *Power King* V-8 and 152-h.p. *Cargo King* V-8 for T-700, and 170-h.p. *Cargo King* V-8 for T-800, develop up to 44% more power per cubic inch than other engines in their class.

New *Master-Guide* Power Steering—is standard on the T-800 and on the T-700 (with 152-h.p. engine). Operative at all times, it cuts steering effort as much as 75% and practically eliminates road shock to the steering wheel. New Ford *Driverized* Cab and controls provide comfort and driving ease to help the driver do hard jobs faster, with less effort.

For complete information, see your Ford Dealer, or write: Ford Division, Ford Motor Co., Dept. T-13, Box 658, Dearborn, Mich.



New Ford factory-installed tandem rear axles are the most modern in the industry. Rubber-bushed suspension reduces shock, minimizes lubrication needs. Power divider with 3rd differential equalizes driving power for longer tire life. Lockout feature standard.

SAVE WITH *ALL THREE!*

1. Gas-Saving Power! **2.** Driver-Saving Ease!
3. Money-Saving Capacities!
And . . . Ford Trucks last longer, too!

FORD *TRIPLE ECONOMY* TRUCKS

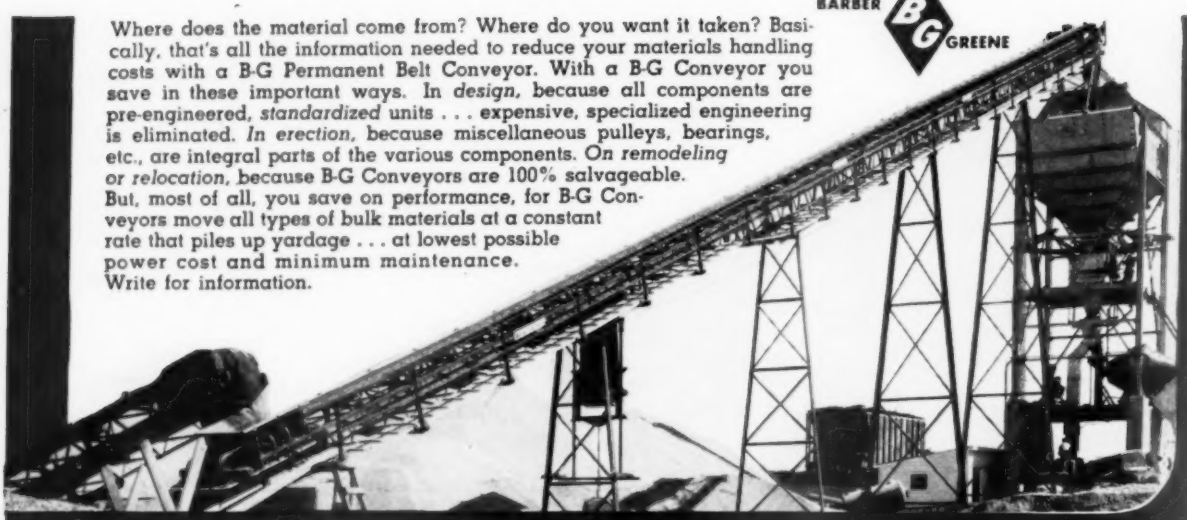
MORE TRUCK FOR YOUR MONEY!

How You Save Money

. . WITH STANDARDIZED *PERMANENT* CONVEYORS

BARBER BG GREENE

Where does the material come from? Where do you want it taken? Basically, that's all the information needed to reduce your materials handling costs with a B-G Permanent Belt Conveyor. With a B-G Conveyor you save in these important ways. In *design*, because all components are pre-engineered, *standardized* units . . . expensive, specialized engineering is eliminated. *In erection*, because miscellaneous pulleys, bearings, etc., are integral parts of the various components. *On remodeling or relocation*, because B-G Conveyors are 100% salvageable. But, most of all, you save on performance, for B-G Conveyors move all types of bulk materials at a constant rate that piles up yardage . . . at lowest possible power cost and minimum maintenance. Write for information.



. . . WITH HEAVY-DUTY *PORTABLE* CONVEYORS

When materials handling calls for a heavy-duty portable conveyor, B-G has the answer, too. Here is the heavy-duty, pneumatic-tired Model 374 available with belt widths of 18", 24" and 30", in lengths of 30' to 60'. The 374 will handle any bulk material—sand, stone, wet concrete, coal—at capacities from 150 to over 425 tons per hour . . . with a single operator. Every aggregate producer, contractor, city, county and state highway department will want full information on the B-G Model 374 Heavy-Duty Portable Belt Conveyor.

B-G CONVEYORS . . . REDUCE COSTS, SPEED WORK AROUND THE WORLD

see your **B-G distributor** . . . or write

on Materials Handling!

ADAPTABILITY

Sketches below illustrate typical mountings which demonstrate the complete adaptability of B-G Permanent Belt Conveyors. Whatever your conveyor requirements, it will pay you to investigate the savings a B-G Conveyor System will bring.

Horizontal permanent belt conveyor —close to ground or on skids

Elevated horizontal permanent belt conveyor

Typical permanent inclined belt conveyor

Permanent inclined belt conveyor with overhung discharge end

Permanent conveyor—horizontal to inclined combination

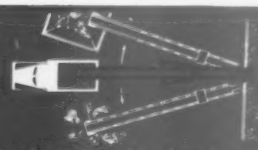
Permanent conveyor—inclined to horizontal combination

VERSATILITY

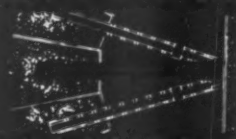
Here are a few examples of what the Model 374 Portable Conveyor, with its complete line of accessories including feeders, vibrating screens, discharge spouts, loading hoppers, etc., can do for you in your heavy-duty bulk handling operations.

Wide reach and high discharge for high, extended storage piles.

Low mast clearance, heavy-duty anti-friction bearing axle, pneumatic tires.



Truck loading, bin charging, or stock-piling by swivelling wheels.



Swivel wheels for loading to radial storage.

Equipped with hopper to elevate or convey wet concrete direct to forms.

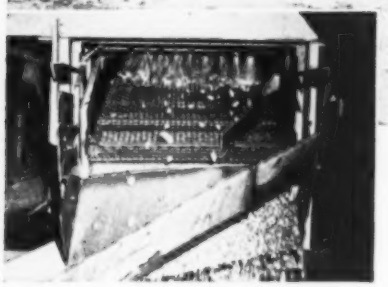
Equipped with hood to prevent loss of materials in dry batch transfer.

Barber-Greene

BG

Aurora, Illinois, U. S. A.

Photo showing newly expanded Plant 3 at Sand and Gravel Division of East Coast Lumber Terminal, Inc.—engineered and equipped for maximum efficiency and production. Note the 2 new Type ETU 5 x 10 single deck Deisters.

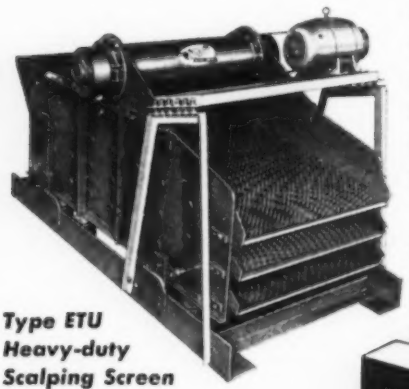


"3,500,000 Tons over this DEISTER

. . . maintenance averages less than $0.29 per 1,000 tons."

(Above) Average daily production of this Model ETU 3 deck, 5 x 10 Deister Screen is in excess of 1,500 tons. The screen sizes and washes grit, ¾" and 1½" sizes.

(Below) This Type ETU Heavy-Duty Scalping Screen, like all other Deister Screens, features opposed elliptical throw . . . vibration fully cushioned . . . low screening angle . . . operates in a bath of oil . . . automatic screen cloth tension . . . adjustable throw.



Type ETU Heavy-duty Scalping Screen

The Sand and Gravel Division of East Coast Lumber Terminal, Inc., Farmingdale, New York—major aggregate producer in central Long Island—is another typical "repeat-order" Deister customer. Based on the outstanding performance of two earlier Deister installations, they recently installed two more single-deck 5 x 10 Model ETU Deister screens in their latest expansion at Plant 3.

Mr. Virgil M. Price, President . . . satisfied with the performance of the original Deister screen, says: "The 5x10 triple-deck Deister has screened 3,500,000 tons of Bankrun feed, gravel content 44%, since installation and is still going strong after 8 years. Maintenance has been less than $1,000—not including screen cloth, of course."

Specialists in the design, manufacture and installation of vibrating screens, the Deister Machine Company offers over 100 models to fit any screening problem. Standard screens come in a variety of 1, 2, and 3-deck types in sizes from 2¼ x 4 to 5 x 14. All screens can be furnished with the Deister Electric Screen Heater.

DEISTER

DEISTER MACHINE COMPANY

1933 EAST WAYNE STREET, FORT WAYNE 4, INDIANA

More than 200 GM Diesel Engines

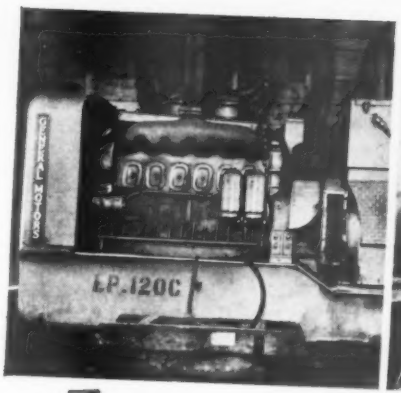
ON LABRADOR IRON ORE PROJECT

GM DIESEL
CASE HISTORY No. 53-222

USER: Iron Ore Company of Canada

INSTALLATION: GM 6-71 powering conveyors and washer. Another GM 6-71 drives Holland hammer mill. Crusher supplies material for Menihek Dam project, 300 miles above base camp. Two of more than 200 GM Diesels used by I.O.C. and contractors in a wide variety of equipment.

PERFORMANCE: Crusher produces up to 500 yards per day, depending upon truck availability. Crushing 12" stone to 1" to 5" sizes; fines used as sand. GM Diesel used previously for lighting at base camp had run 18,000 hours without any downtime.



—and this one worked 18,000 hours without overhaul

Pushing a railroad 360 miles through wilderness to tap rich iron deposits on the remote Quebec-Labrador border, the Iron Ore Company of Canada and contractors building the road, dams and terminal facilities depend upon General Motors 2-cycle Diesel engines for more different kinds of work than any other engine.

Among the many good reasons is GM Diesel's dependable 2-cycle operation which means more power from a smaller, more compact engine. Smoother, quicker-acting faster-starting power that corresponds to increased loads and gets work done faster at lower cost.

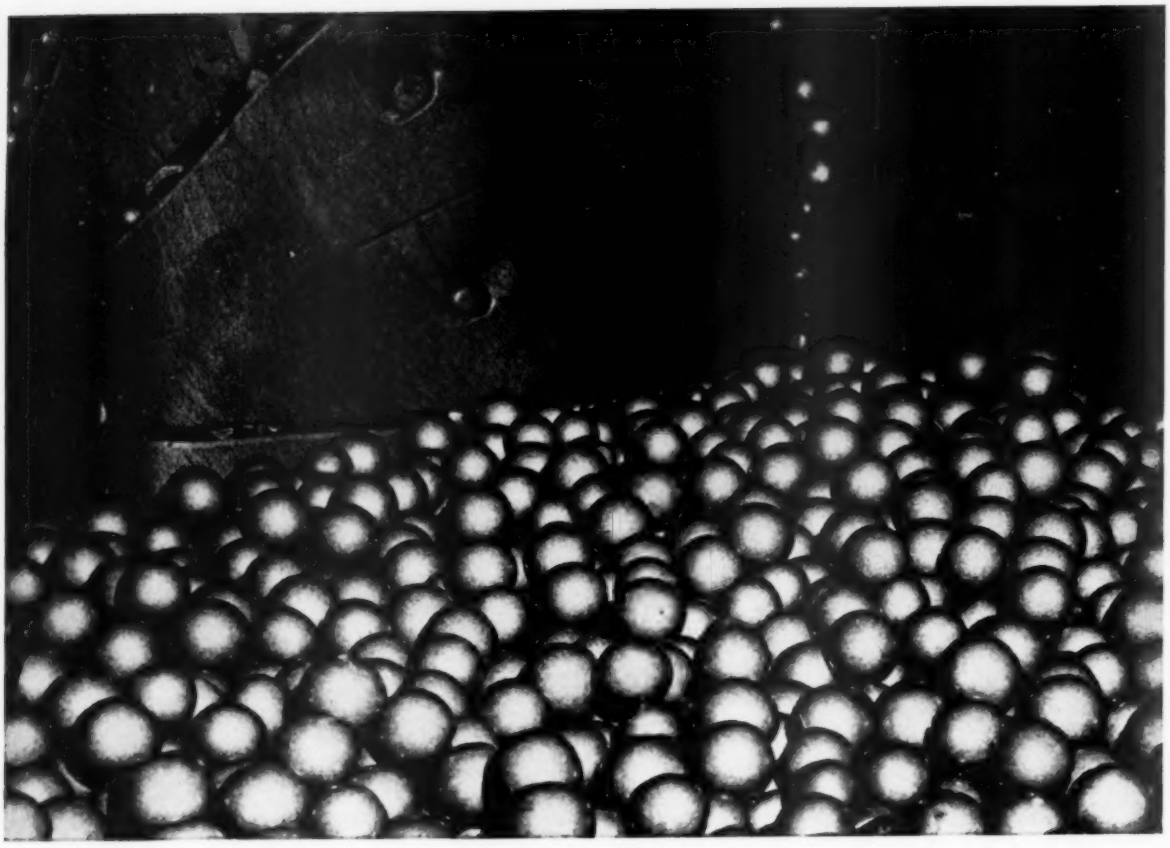
Also, in isolated operations like this—where fuel and all supplies had to be flown in—lighter weight and interchangeability of GM Diesel parts insure higher availability and cut costs. Most moving parts are identical for all Series 71 engines—2 to 24 cylinders—so parts cost less and inventory requirements are lower. Users need never worry about replacements or service, for GM Diesel engines and parts are sold through a world-wide organization of distributors and dealers. The one near you will welcome your inquiry on any power problem.

DETROIT DIESEL ENGINE DIVISION
GENERAL MOTORS • DETROIT 28, MICHIGAN
Single Engines . . . 16 to 275 H.P. Multiple Units . . . Up to 840 H.P.

It pays to STANDARDIZE on

. . . available in more than 750 models of equipment built by over 150 manufacturers

GM
GENERAL MOTORS
DIESEL POWER



You Can Cut Costs Here

SHEFFIELD

ARMCO

MOLY-COP

COPPER · MOLYBDENUM · ALLOY
GRINDING BALLS

Sheffield copper molybdenum alloy steel grinding balls are manufactured by automatically controlled methods which produce a ball of finer, denser, more uniform structure.

Moly-Cop balls wear evenly and retain their spherical shape longer. They have greater hardness for wear and toughness to resist spalling and chipping. This all adds up to high production rates with less down time, less charging and less power.

Moly-Cop grinding balls can make an important net saving in your grinding cost.

If you have not already proven the value of Moly-Cop balls, get in touch with us before making your next purchase.

SHEFFIELD STEEL
DIVISION
ARMCO STEEL CORPORATION
SHEFFIELD PLANTS: HOUSTON KANSAS CITY TULSA

EXPORT REPRESENTATIVES: **ARMCO INTERNATIONAL CORPORATION** · Middletown, Ohio

ROCK RATED

before it ever reached the pit!

Look at the development behind the P&H Model 1055 and you see why this 3½-yd. shovel can outproduce machines of greater rated capacity.

It's the one rock shovel built completely from progressive ideas. P&H was first with the added strength of welded steel construction . . . the pioneer in better weight distribution to let you use full digging power at tooth point . . . the leader in cushioned hydraulic control. And it's P&H with revolutionary Magnetorque* that swings you through a faster, smoother cycle in any kind of weather. Count on *15% additional rock production* from this P&H advancement alone!

There's a companion P&H 955A Shovel in the 2½-yd. class equally as outstanding. Write today for further facts about either model.

with P&H **MAGNETORQUE*** ELECTRIC SWING

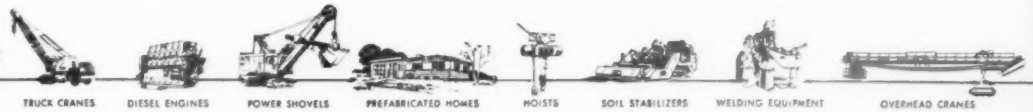
. . . FRICTION FREE
. . . . TROUBLE FREE
Lasts the life of the machine!

*T.M. of Harnischfeger Corporation for electro-magnetic type coupling.

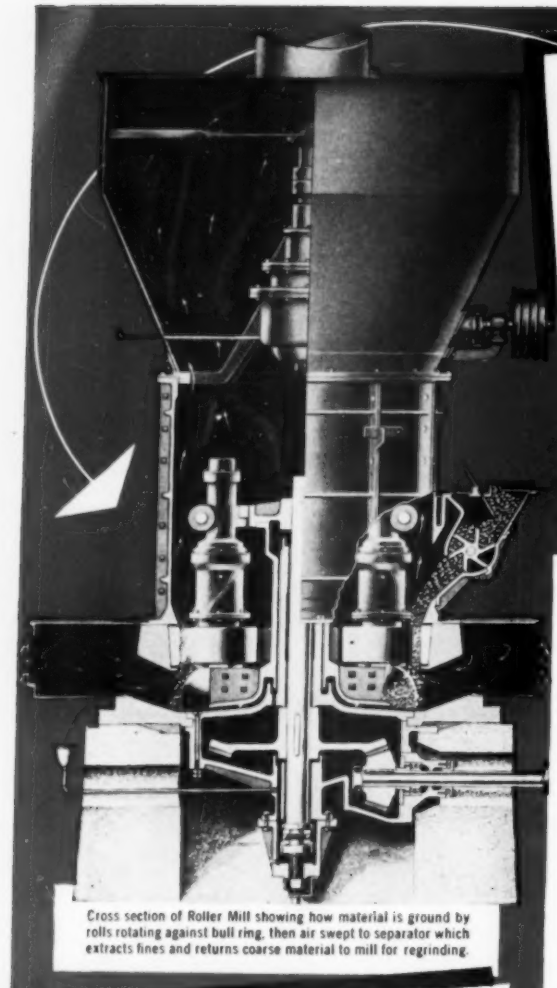
P&H LARGE EXCAVATOR DIVISION

HARNISCHFEGER CORPORATION
MILWAUKEE 46, WISCONSIN

the P&H Line



TRUCK CRANES · DIESEL ENGINES · POWER SHOVELS · PREFABRICATED HOMES · HOISTS · SOIL STABILIZERS · WELDING EQUIPMENT · OVERHEAD CRANES



Cross section of Roller Mill showing how material is ground by rolls rotating against bull ring, then air swept to separator which extracts fines and returns coarse material to mill for regrinding.

Increase Your Output Of FINE GRINDING

...with greater uniformity
...at lower cost

WILLIAMS Roller Mills

Limestone, burned and hydrated lime, clays, kaolin, talc, gypsum — whatever the material, if it has to be finely ground, there's a Williams Roller Mill to do it — faster, for stepped up production — more accurately and uniformly —and at far less cost!

Automatic and continuous in operation, the Williams also dries and grinds simultaneously. Instantly adjustable for finenesses of 20 to 400 mesh, even down to micron sizes. No built-up cushions of "fines" can impair grinding efficiency because the constant upward air current carries ground materials to the air separator which discharges *all* finished materials and returns *only* the oversize product to the mill for further grinding.

Feeding rate is automatic and self-adjusting, positive and simple in action—Anti-friction roller and ball bearings reduce down-time for lubrication, save oil and put more power into grinding—Take-up for wear is continuous and automatic—Rugged forgings, electric steel and alloy castings guard against wear and breakdowns—These and many other outstanding features have made Williams Roller Mills the standard for fine-grinding operations.

Write For Catalog

OTHER WILLIAMS EQUIPMENT

HAMMER MILLS

"Super-Slugger" models, with capacities up to 550 tons per hour, that reduce power shovel loaded rock to 1½", ¾" or agstone in one operation.

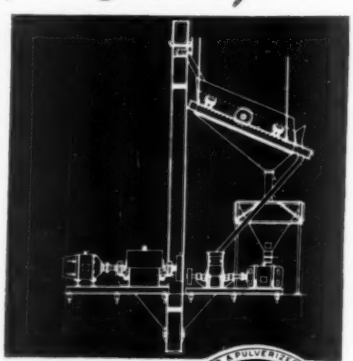
"Slugger" models, with capacities up to 100 tons per hour, that reduce "one-man" size stone to 1¼", ¾" or agricultural limestone in one operation.

Other models, with capacities from 5 to 200 tons per hour, for reducing 4" to 6" stone to ¾", ½" or agricultural limestone in one operation.

IMPACT and DRIER MILLS
AIR SEPARATORS
VIBRATING SCREENS

WILLIAMS COMPLETE PLANTS

Backed by years of know-how and experience, Williams can build any type of ready-to-install plant to handle crushing, grinding, air separation, sifting, conveying and magnetic separation including storage bins and electrical equipment.



WILLIAMS PATENT CRUSHER & PULVERIZER CO.
800 ST. LOUIS AVE. ☆ ST. LOUIS 6, MO.

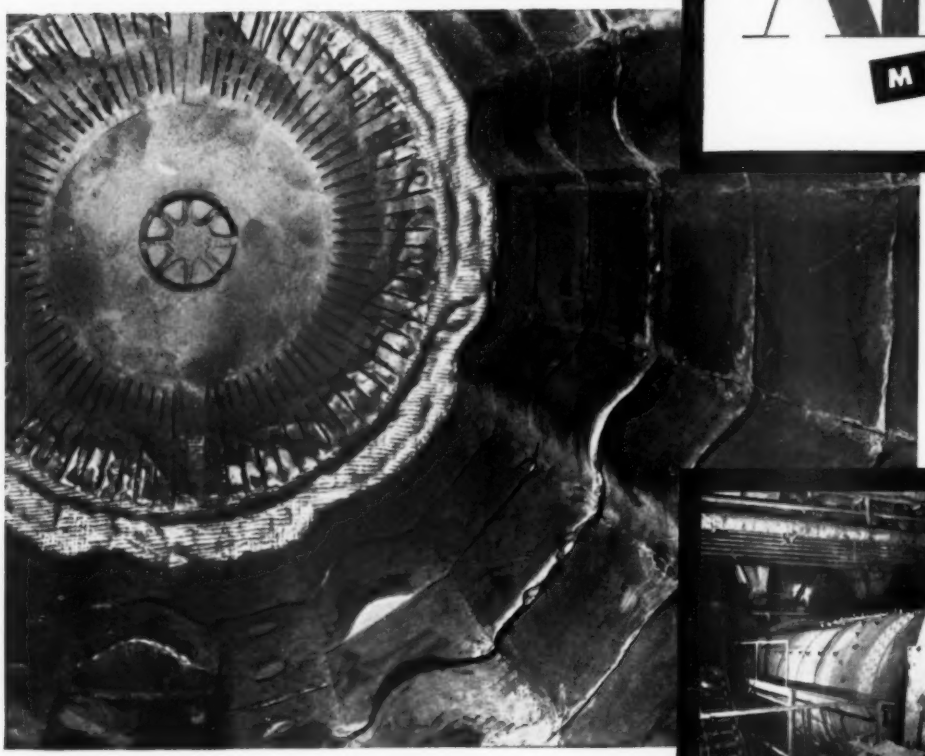
WILLIAMS

CRUSHERS GRINDERS SHREDDERS

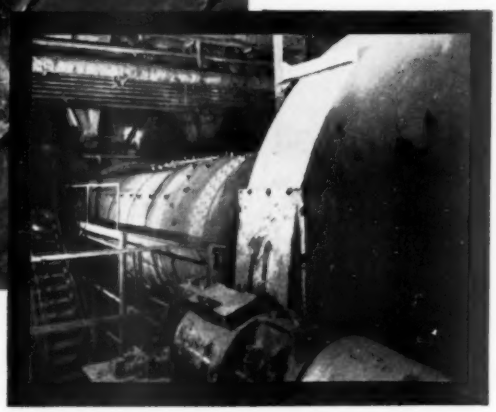
OLDEST AND LARGEST MANUFACTURER OF HAMMER MILLS IN THE WORLD

STANDARD PORTLAND CEMENT

increases liner life with ABK® METAL



Interior of Standard Portland Cement ball mill. Note good condition of liners after 6 years service.



Standard Portland Cement Division, Diamond Alkali Company, Painesville, Ohio, has found that ABK Metal ball mill liners give markedly increased service life. Installed six years ago, these ABK Metal liners have at least 18 months of service left. They replaced liners installed in 1943 that were removed after only five years of relatively light use in low production schedules.

Wherever extreme abrasion is a major problem ABK Metal parts have consistently proved superior to ordinary "abrasion-resistant" materials. The experience of Standard Portland Cement is typical among firms that require long, uninterrupted operation of equipment handling abrasive materials. Specify these exclusive Brake Shoe nickel-chrome castings with controlled matrix structure and hardness when you want the extra service that means high efficiency production and low maintenance costs. Write today, for complete information.

AMERICAN Brake Shoe COMPANY

BRAKE SHOE AND CASTINGS DIVISION

230 Park Avenue, New York 17, N. Y.
109 N. Wabash Avenue, Chicago 2, Illinois

Houston • St. Louis • San Francisco • Toledo

2426

drive it anywhere

—get faster set-ups, better hole spacing, greater footage, better fragmentation, lower costs

Le Roi-CLEVELAND

T286 Self-Propelled Dual Drill Rig

It's 2 Le Roi-CLEVELAND patented air feeds and drills with air-motor booms mounted on a 25-hp tractor

3 speeds forward — 1 speed reverse

USE a Le Roi-CLEVELAND T286 and watch your men go places — go places they couldn't get to before on wagon-drill jobs. The T286 is self-propelled; you can drive it over almost any terrain — and tow the compressor right along behind. Your men can make their set-ups faster — spot holes easier for better fragmentation — without tugging or pushing.

Besides being self-propelled, the T286 drills in any direction — at any angle — uses less air. One Le Roi Airmaster 600 cfm Compressor provides all the low-cost air you need.

Have your nearby Le Roi distributor tell you *all* the reasons why it pays to use the Le Roi-CLEVELAND T286 Self-Propelled Dual Drill Rig. Write for Bulletin RD-21.

LE ROI COMPANY

A Subsidiary of Westinghouse Air Brake Co.

CLEVELAND ROCK DRILL DIVISION 12500 Berea Road, Cleveland 11, Ohio

Plants: Milwaukee, Cleveland and Greenwich, Ohio

RELY ON THE "C"-man...

• From windjammer to atom age . . . the Chase Bag Company has experienced countless revolutions in technocracy during 107 years. And the Company has gained a wealth of experience and know-how from every single change. Today, the Chase Bag Company stands alone as the oldest expert in the packaging industry.

Backed by 107 years of packaging experience

Chase Bag experience costs you nothing, yet it's apparent in the recommendations of every "C"-Man.

It's apparent in every Chase Bag product, too . . . the 107 years' insistence on quality—a striving for maximum product protection and package appeal.

You cannot put your packaging problems in more capable hands. You cannot put your product in better bags. *Contact your "C"-Man today!*

over a century of know-how is behind every CHASE MULTIWALL BAG

Low Cost Protection For Your Rock Products

The low-cost way to protect your rock products is to package them in Chase MULTIWALL Bags. It's the economical package with all these features:

- Fine appearance
- Clean, colorful printing
- Dependable product protection
- More sales appeal
- Easy to stack and store
- Wide selection of sizes, types

Available from 2 to 6 plies—Sewn Valve, Sewn Open Mouth, Pasted Valve, Pasted Open Mouth.

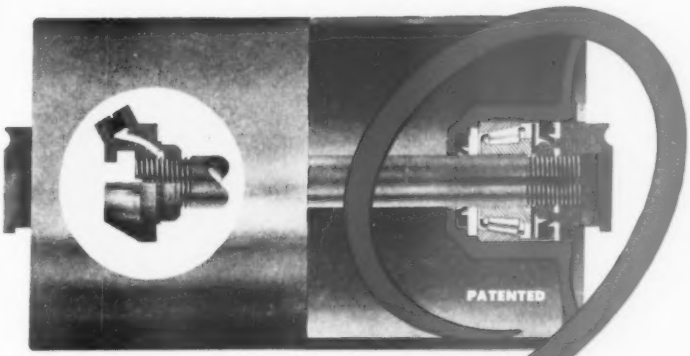
For samples and current prices, write Department 14-H

CHASE BAG COMPANY General Sales Offices: 309 W. Jackson Blvd., Chicago 6, Ill.
30 BRANCHES AND SALES OFFICES—STRATEGICALLY LOCATED

UST* Continental Idlers

*** UNIT-SEALED PRE-LUBRICATED TIMKEN BEARINGS**

Saves Grease!
Saves Labor!
Saves Belts!



STANDARD DUTY IDLER

CGC UNIT-SEALED
CGC PRE-LUBRICATED
CGC TIMKEN BEARINGS

Continental's Unit-Sealed "UST" Conveyor Idlers, incorporating Timken Bearings, Garlock Klozures, are the answer to the operator's prayer.

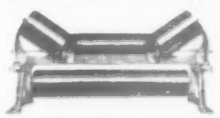
The Unit Bearing Assemblies—"sealed unto themselves" provide an ample but not excessive grease reservoir. This represents a saving of grease and further eliminates any possible migration of the grease from upper to lower bearings on inclined rolls. The lubricant is a top quality water repellent grease of a stable consistency with a wide temperature range for long life.

Most important—this construction permits operating the Continental "UST" Idler without relubrication for 1-2-3 years depending upon the severity or character of conditions.

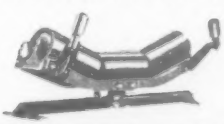
For detailed information on these idlers write for Bulletin R.P.-116

SELF-ALIGNING FLAT BELT IDLER

RUBBER DISC IMPACT IDLER



GRAIN CONCENTRATION IDLER



SELF-ALIGNING TROUGHING IDLER

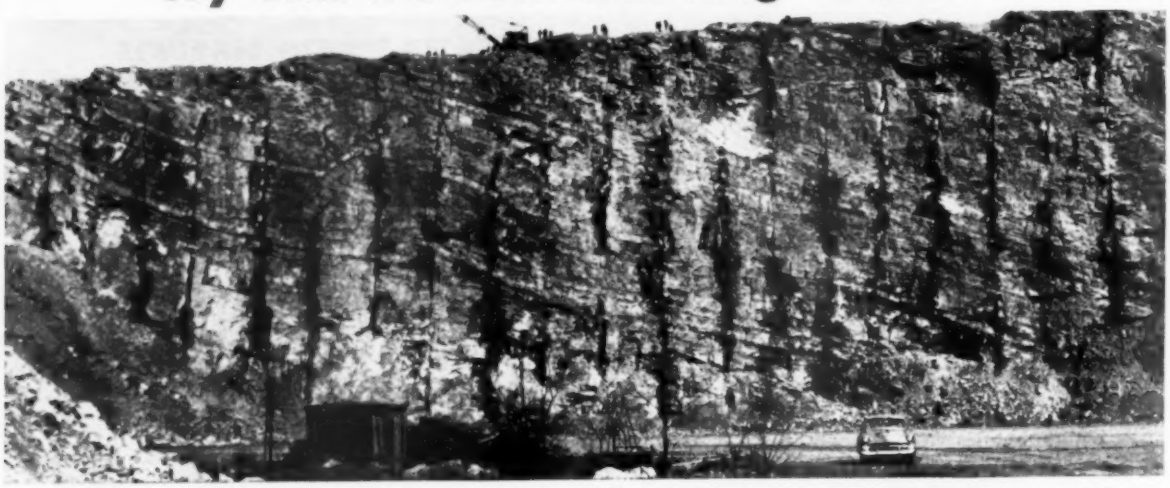
***Long Life*- THE ULTIMATE IN MINIMUM MAINTENANCE**

CG-5209

INDUSTRIAL DIVISION
CONTINENTAL GIN COMPANY
BIRMINGHAM, ALABAMA

ENGINEERS CGC ATLANTA • DALLAS • MEMPHIS • NEW YORK CGC MANUFACTURERS

For Better Fragmentation, Greater Safety— Try This Du Pont Blasting "Team"



BEFORE. Getting set for blast at the Warner Co.'s Union Furnace, Pa., limestone quarry. Average height of face—170 feet. To handle this hard-shooting formation, quarrymen loaded 43,000 pounds of Du Pont "Nitramon"® and "Nitramex" #2® and delay-connected the charges with Du Pont MS-17 Connectors. Tough job, but the Du Pont blasting "TEAM" does it to Warner Company's satisfaction.

AFTER. Blast points up "TEAM'S" strength. The shot brought down 150,000 tons of well-broken railroad ballast and road stone, with vibration and backbreak cut to a minimum. And safety's at a peak, since neither "Nitramon" or "Nitramex" #2 can be detonated by shock, friction or the strongest of blasting caps—*only* by a "Nitramon" Primer, itself relatively insensitive. In addition, neither contains nitroglycerin, eliminating headaches from handling. MS-17 Connectors add even greater safety to Warner's operations, as there is no need for caps on the job until blast time; thus, no danger of prematures from lightning.

So why not simplify tough shooting on your own operation with a Du Pont blasting "TEAM." There are many such efficient combinations, and one of them's right for *your* quarry. To get the facts on all Du Pont explosives, blasting supplies and accessories, contact our representative. He'd like to be of service to you. E. I. du Pont de Nemours & Co. (Inc.), Explosives Department, Wilmington 98, Delaware.

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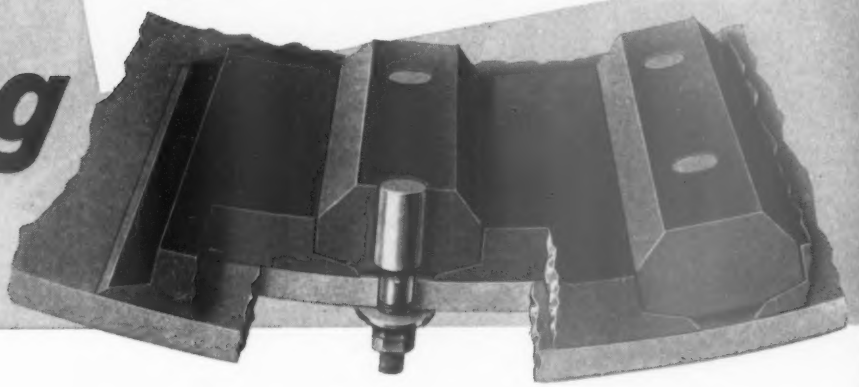
- Correct sizes make tighter joints—eliminate shell wash.
- Bolt supports located near the bottom of the bar . . . last for life of the lining.



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You can do more and better grinding, for less money, with U·S·S Lorain Rolled Plate Linings. The output of your mill increases when the usable diameter increases, and this is just what happens when rugged Lorain *rolled steel* plates are used instead of ordinary castings. Lorain Liners can be much thinner due to their superior strength. Their lighter weight simplifies handling.

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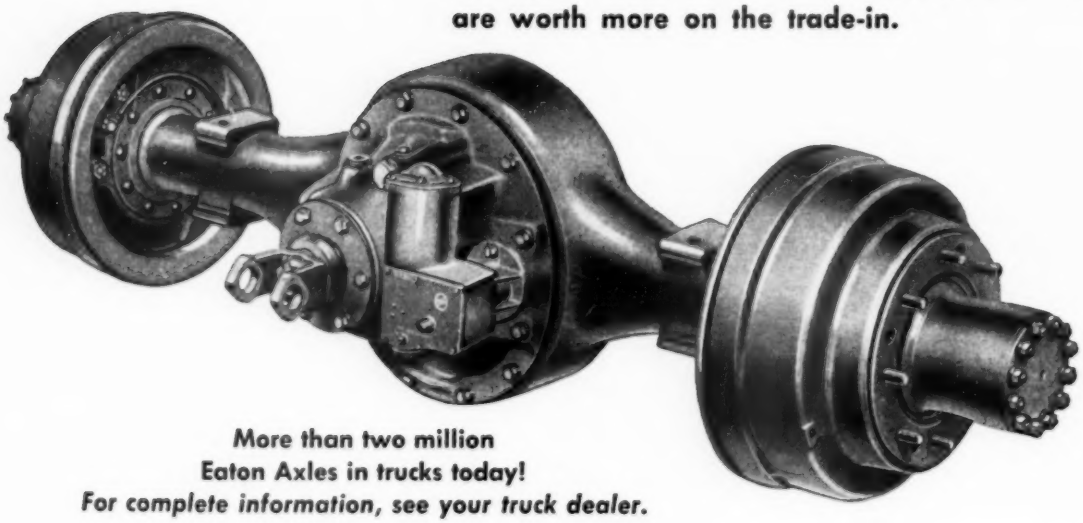

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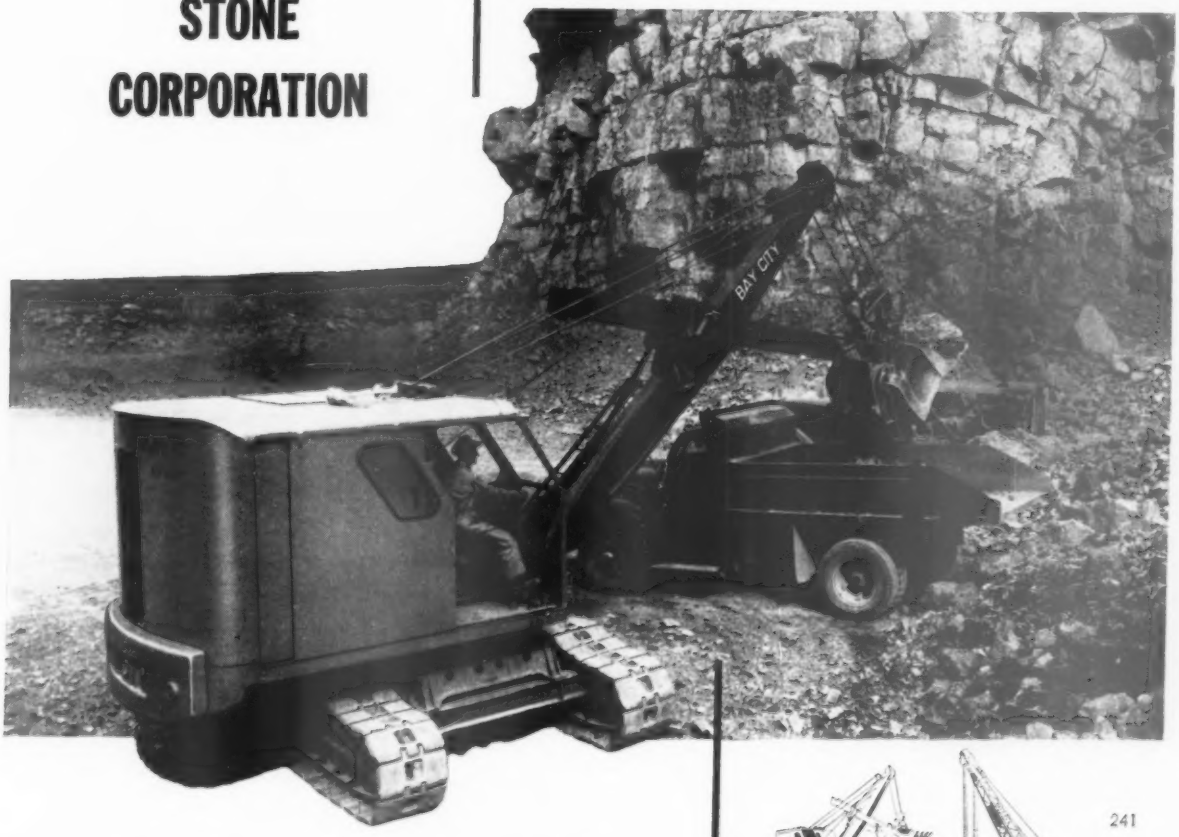

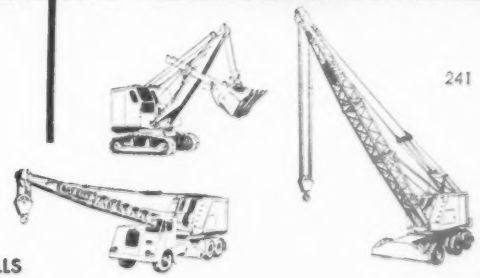

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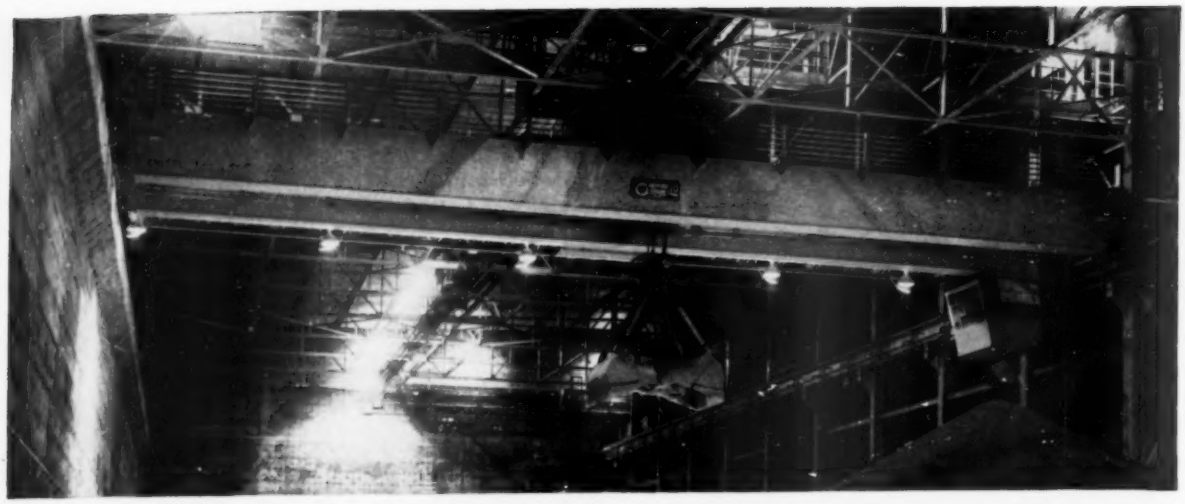

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Outlook for construction continues favorable

BEFORE THE START OF 1954, forecasts were almost unanimous that the nation's economy would level off in general this year and that there would be stiff competition for sales in most all lines. The forecasters had construction slated for a very modest decline of a percent or so from the all-time dollar-volume records established in 1953 which, presumably, would have reflected in a slight drop in sales by the rock products and concrete products industries.

Construction Prospects

A reappraisal of business at midyear bears out that the forecasting experts were right in most of their predictions about general business. However, construction is booming at an unprecedented rate while the general economy lags, and there is strong likelihood that a new all-time record for dollar volume of construction and physical volume of work in place will have been established by year-end. Industry strikes may turn out to be the only reason that the cement industry does not establish another new record.

The nation's second biggest industry — construction — was at the rate of sixteen and two-thirds billion dollars for the first six months of this year which is two percent more than in 1953, and it is significant that there was a sharp uptrend starting during the second quarter. Even more significant is that private spending for construction was seventy percent of the total, which indicates that the construction industry is on sound footing.

Federal spending is down and industrial and agricultural construction are lagging, but gains in mass housing, commercial building and highway construction have more than offset these losses. Signs indicate that industrial and public construction are to be on the increase. Backlog of demands for the building of schools, stores, offices, utilities and highways to keep step with the growth in population continues enormous and there is a total backlog for heavy construction alone in excess of seventy-five billion dollars. Whereas the construction industry accomplished almost three hundred billion dollars of total work since World War II, including the building of eight million homes, three hundred thousand miles of highways and some fifty billion dollars worth of business facilities, requiring nearly two billion barrels of portland cement, an almost undiminished backlog of deferred construction still exists.

Looking ahead into the last half of 1954, the volume of public works will increase and a renewal of federal construction projects is expected. Nonresidential public construction, particularly for schools, will continue at a high level, highway construction will continue to gain momentum and housing is expected to continue at about the 1953 high rate.

Appraisal of the outlook for highway construction is particularly encouraging from the point of view of the public and the nation, aside from those engaged in construction and in supplying the materials to build and repair roads. It is now being recognized that three and one-half billion dollars must be spent annually over a ten-year period to correct deficiencies in the Federal-Aid highway system alone.

President Eisenhower is talking of expenditures of fifty billion dollars a year for highways, and the now recognized total figure required, including maintenance and repairs, is eight billion dollars annually over a ten-year period.

The recently passed record Federal-Aid highway bill, of $1,932,000,000 to be spent for the two fiscal years beginning July, 1, 1955, provides fifty percent more federal aid to the states and is a very encouraging sign that the seriousness of the highway situation is being recognized.

Construction needs seem tremendous but it must be remembered that the cost of construction is two and one-half times as much as in 1939. Actually the physical volume of work is only one and one-half times as much as in 1939 which really is not great considering the long deferred backlogs, population growth and high economic level.

Demands for Rock Products

An interesting point, in comparing 1939 with 1953 or 1954, is that cement usage has surpassed the rate of growth in construction, so that thirty-five percent more cement is now being used for the same amount of work. Cement usage has increased faster than the demand for other building materials because of the industry's sound policy in holding down percentage price increases and in developing new uses and more inexpensive applications.

Overexpansion of the construction contracting industry and resulting competition may reflect to the good of the cement and aggregates industries provided that price-cutting between producers does not become substantial. Builders of all types are cutting profit margins and effecting many cost savings, with the result that building costs are dropping below estimates. These savings are being turned into more volume of building which means more use of cement and aggregates.

Bror Nordberg

Bonding in Particle Structures

ROCKY'S NOTES

NATHAN C. ROCKWOOD

EVERY ROCK PRODUCTS OPERATOR who has any kind of a crushing process knows that some materials he deals with crush easily and others are tough, hard and resistant to all types of crushers. The fundamental difference is not so much in the kind of rock as in the kind and strength of chemical bonds which hold the various particles of minerals together in the rock. Hence an understanding of the nature of these bonds must be essential to any really fundamental research on aggregates and on concrete. Thus far an immense volume of literature has accumulated on the results of many tests on both concrete and aggregate, but it remains for someone to relate these test results to the chemical constitutions of the mineral aggregates composing both natural rocks and concrete. To do this requires a working knowledge of chemical constitution, and of modern structural or physical chemistry, which we suspect many of those who contribute much of the test data lack.

To obtain the requisite knowledge one must read and study only the very latest and most authoritative text-books on the subject, because all the available knowledge in this field is very recent, and each new text expands on preceding ones. Some of the best text-books in this sicence have not until now been available to American students who are not adept in foreign languages. However, since the latest World War an enterprising firm of Dutch publishers has been busy translating and publishing in English many of the works of foreign specialists, and these are now readily available to American researchers. One of the most recent of such books to come into our hands is "Chemical Constitution, an Introduction to the Theory of Chemical Bond," by Dr. J. A. A. Ketelaar, professor of physical chemistry in the University of Amsterdam (Holland).* Naturally, this book is not easy reading, and one must start with a fairly comprehensive knowledge of physics and chemistry as taught during the academic years of most of those now experienced in concrete and concrete aggregate research.

A few excerpts from the author's introduction are enough to give some inkling of his approach and to his aim. It will be seen that the reader and student will not find ready-made answers to his problems, but the book should stimulate an interest in honest-to-goodness fundamental research in cement, concrete and aggregates in a field thus far very little explored by anyone. Our author states: "The aim of modern chemistry can be formulated as the understanding of the properties of substances as functions of the constituent atoms, that is, stated more accurately, as the functions of the atomic numbers which indicate the positions that the elements occupy in the Periodic System. The latter is the basis on which the structure of the whole of chemistry should be and can be raised. The foundations, on which this basis rests in its turn: the explanation of the Periodic System from the principles of the behavior of electrons on the one hand and of the nuclei, composed of protons and neutrons, on the other hand, belongs in the realm of physics. We are still very far from this goal. Really in the sense of understanding we still know practically nothing in chemistry, in spite of the fact that such an overwhelming amount has been achieved experimentally and technically." Since that is intended to apply to chemistry as a whole, it is understandable why cement and concrete chemistry is in its present status. But that should be a challenge and not a discouragement; or as our author puts it: "The fact that theory lags behind experiment and factual knowledge can only form a stimulus to reduce this gap."

Subjects Covered

The contents of the book are divided into five main subject headings, with 45 subdivisions, each numbered, so it is possible to use the index quite effectively. Each main section is followed by references to the literature on the subjects covered. The first section is "The Periodic System of the Elements; the Four Types of Bonding." The second section is on "The Ionic Bond." The subdivisions are: The ionic radius; crystal structures; lattice energy; double decompositions; complex compounds; ion-ion complexes; silicates and other poly-nuclear complexes; ion-molecule complexes; electrolytic dissociation; strength of acids and bases; volatility; hardness; solubility and hydration.

The silicates are described in the way we have noted before, but perhaps a little more clearly. In the development of the silicate structure there are, however, some difficulties. Our author says: "In the application (of the fundamental characteristics) to natural minerals some complications occur through the multiple mixed crystal formation. Thus, in particular, a part of the Si^{4+} in the oxygen tetrahedra is often replaced by Al^{3+} but there is often aluminum as well which does not belong to the tetrahedra of the skeleton. Furthermore a part of the oxygen ions is sometimes present as $(OH)^{1-}$, sometimes isomorphously replaced by F^{1-}, which is the same size. The OH^{1-} and F^{1-} never form part of the skeleton of oxygen tetrahedra." The reason is, of course, that an ion with a single negative charge cannot be connected to two positively charged ions of silicon — the one-fourth of the single silicon ion charge would neutralize all the negative charge on an OH ion. Consequently we have to revise our older ideas of silicate chemistry. Our author says: "In older chemical analyses and the empirical formulas based on them the OH ions were often incorrectly reckoned as water of crystallization. The earlier division into metasilicates, orthosilicates, etc. is worthless."

Section III is on "The Atomic Bond." Subsections are on: Particles and waves; wave function and wave equation; the hydrogen atom; the hydrogen molecule ion H_2^+; the hydrogen molecule H_2; the electron spin; one, two and three electron bond and Born-repulsion; directed valency, hybridization; onium compounds; complex compounds; multiple bonds; atomic radii; bond energy; reasonance between valence configurations or mesomerism; conjugation of double bonds and free electron pairs; other resonating molecules; free radicals; theory of color; chemical reactions; wave mechanical calculations, valence bond and molecular orbital method; dipole moment, non-alternating hydrocarbons. We have quoted these terms at length not to dismay the novice but for the benefit of the few readers who know what they mean.

The difficulty in understanding mod-

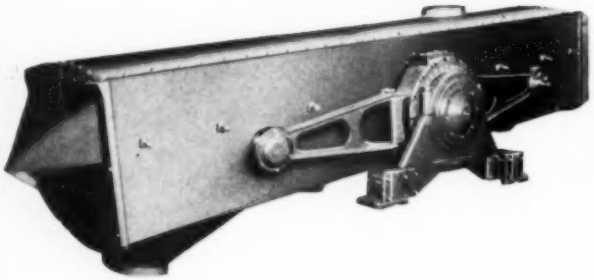
(Continued on page 174)

*Elsevier Publishing Co., Amsterdam; Houston, Texas; New York, and London, England. The American address is Elsevier Press, Inc., 402 Lovett Blvd., Houston, Texas.

VIBRATING SCREENS

FOR

The CEMENT INDUSTRY



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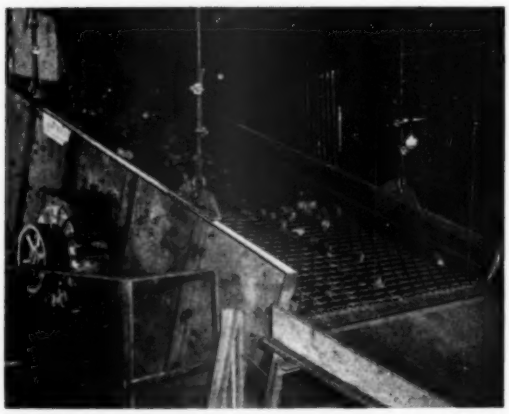

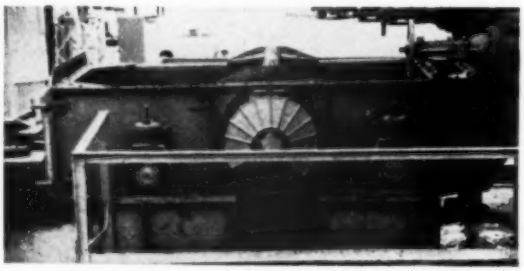

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By NATHAN C. ROCKWOOD

Arbitration of Some Fine Points in Labor-Union Contracts

AS A MATTER OF HUMAN RELATIONS all awards of arbitrators in the interpretation of labor-union contracts have interest and educational value. Some controversies are obviously trivial so far as money value is concerned, but nevertheless are hard fought to establish or maintain a principle. One of the prime principles of effective management is, of course, the right to select for promotion those best qualified. Management must be permitted to determine such qualifications in its own way, provided such way is reasonable and fair. We have as illustrations two recent cases, both involving large corporations where every effort is made to avoid conflicts through employment of the highest type labor-relations executives.

The first of these involved the International Minerals and Chemical Corp., and the local of the International Chemical Workers Union, at its Bartow, Fla., phosphate plant. The issue went to a board of three arbitrators, one employer-appointed, one union-appointed, and a chairman agreed upon by both. The union-appointed member, as usual, dissented from the decision of the other two — they always do when the decision is against the union contentions.

When its new Bonnie chemical plant was completed the company sought to fill jobs in two classifications — Start-up Operator, and Start-up Helper — seven jobs in each classification. Notice was posted on the plant bulletin board. One of the requirements posted was "high-school education or equivalent required."

Contract Seniority Provisions

Article 5 of the union contract is as follows: "Section (a). Seniority is defined as the length of continuous service with the company, and the company and the union affirm that seniority is a principle of employment which gives preference to one employe over another based on length of continuous service. The parties jointly recognize the difficulty of providing in this agreement for the many possible variations in applying this principle to the diverse situations in the plant. However, as a policy it is agreed that senior employes shall be considered as having preference in matters of layoff, rehiring, promotion and transfer, providing always that the senior employes shall have the necessary qualifications to perform the work to be done, provided any such employe shall have the right to refuse any promotion or transfer."

Extracts from the arbitrator's report read as follows: "Union's Argument— The company's basis for the determination of qualifications (high school education or equivalent) tended to discriminate against the senior employes who were otherwise qualified and who could have done the work if they had been given the opportunity. The company gave two of the start-up jobs to two employes who did not meet the company's announced basis for the determination of qualifications. These two employes have since been upgraded; this shows that the company's basis for the determination of qualifications was not necessary to do the job and was too high. Further, the basis for the determination of qualifications here used by the company is not used in any other chemical plant; no other chemical plant requires a high school education or the equivalent. This clearly shows that the company is wrong.

"Company's Argument — The company's chemical plant utilized a new process and new equipment. Since both were untried both in the company and in the industry, the company was faced with the problems of setting standards for the jobs in the chemical plant, initially manning the chemical plant, and then of training the selected employes. The company decided that it needed men of at least average intelligence — that the general qualification for the jobs was that the men have at least average intelligence. As a basis for determining such average intelligence the company decided to use a high school education or the equivalent. To determine upon standards for the equivalent of a high school education the company adopted a recognized method of testing intelligence and selected for use the Wonderlic Test and the Rogers Mathematical Achievement Test.

"The company decided that it needed men of at least average intelligence first because the plant had 276 automatic controls, which if not properly regulated and adjusted, would result in damage to the equipment, loss of the product and possible injury to the employe, and second because it wanted men who after the initial startup could be trained and would be in a position to move up and take over key jobs.

"The national average score for high school graduates on the Wonderlic Test is 57 percent and on the Rogers Mathematical Achievement Test is 50 percent. Rather than use such national averages (which the company believed might be higher than the average for high school graduates in the area of the company's operations), the company gave these tests to the high school graduates in the company and established to its satisfaction that the average in the area was 37.3 percent on the Wonderlic Test and 24.1 percent on the Rogers Mathematical Achievement Test. The company therefore used these percentages for the equivalent of a high school education."

Two senior employes who were not high-school graduates took the tests and failed. The union contended these two were as well qualified as two who got the jobs. One of the successful applicants was mistakingly believed to have had a high-school education and the other on going into military service lacked a few months of completing his course.

Arbitrators' Decision

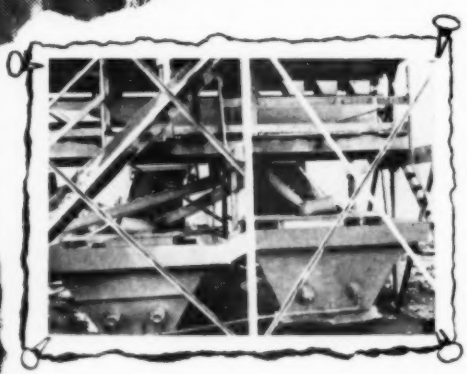
After discussing the various points involved in both arguments, the majority decision of the three arbitrators was: "Evaluating all the evidence presented at the hearing we cannot properly conclude that, in view of the problem with which the company was faced at the time, the basis for the determination of the qualification (high school education or the equivalent) was an unfair basis. Since the grievants were not qualified under this basis, they were not entitled to the jobs in question. Therefore, as far as the back pay request by the grievants is concerned, since neither of the grievants would have gotten the disputed jobs in the first place, they lost nothing for which they should be reimbursed.

"There is an additional reason why we cannot order the company to give the grievants the posted jobs for which they bid, and that is that such jobs no longer exist. The company has abolished all Start-up Operator and Start-up Helper classifications and has upgraded the employes who held such jobs. We have no power to order the company to fill non-existant jobs.

(Continued on page 176)

SAND TO EXACT SPECIFICATION FOR 850,000 YARDS OF AGGREGATE

WITH Eagle WASHING AND CLASSIFYING EQUIPMENT



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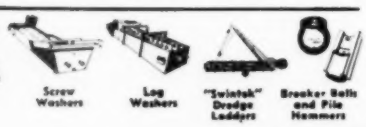


PEOPLE

IN THE NEWS

General Manager

R. NEIL CHRISTY, vice-president of production and engineering, The Marietta Concrete Corp., Marietta,

R. Neil Christy

Ohio, has been named general manager of the branch plant, The Marietta Concrete Corp. of Florida, Hollywood, Fla. He will direct operation and sales activities of this new plant which was erected last year for manufacturing interlocking concrete block, precast concrete wall panels and farm and industrial silos.

Production Manager

AUGUST R. RUMP has been named production manager of operations for the western division of United States Gypsum Co., Chicago, Ill. He succeeds the late M. H. Basquin. C. Harry Rosier has been named operations manager of the paper, roofing, insulation and metal divisions, succeeding J. H. Setinsky, who has been appointed operation manager of the western gypsum and lime division.

Chairman of New Group

THOMAS ROBINS, JR., president of Hewitt-Robins, Inc., Stamford, Conn., is temporary chairman of the American Synthetic Rubber Corp., a newly formed corporation jointly owned by 29 firms that have banded together to place a single bid to buy one of the Government-owned synthetic rubber plants now up for sale to private industry. The corporation has an authorized capital of $6.6 million and individual companies have pledged investments ranging from $5000 to $2 million, and each will receive some 500 tons of rubber a year for every $50,000 invested. Mr. Robins, who took the lead in organizing the new bidding group, said that the act passed by Congress to dispose of some $500 million worth of Federal synthetic rubber plants, emphasizes the importance of providing a place in the synthetic rubber program for companies other than the large tire manufacturers, and he thinks the American Synthetic Rubber Corp. provides an answer to this requirement.

Heads Asphalt Institute

J. E. BUCHANAN, president of the University of Idaho, Moscow, Idaho, has been elected president of The Asphalt Institute, New York, N. Y., to succeed Bernard E. Gray, who has retired after 24 years of service with the Institute. Mr. Buchanan, after graduation from the University of Idaho in 1927, joined its teaching staff as an instructor in civil engineering. He became assistant professor in 1929 and nine years later was elected dean of the college of engineering, director of the engineering experiment station, and professor of civil engineering. From 1936 to 1948 he was research engineer with The Asphalt Institute, Pacific Coast Division, San Francisco, Calif. In 1946, after four years' service in the U. S. Army Corps of Engineers, he was elected president

J. E. Buchanan

Bernard E. Gray

of the University of Idaho, which position he has relinquished to become president of The Asphalt Institute.

Mr. Gray, following graduation from Tufts College in 1911, was for several years resident engineer with the Massachusetts Highway Commission. He joined The Asphalt Institute in 1930 as highway engineer, subsequently becoming chief engineer, general manager and president.

Named Vice-President

PAUL F. KEATINGE has been elected vice-president and director of sales of Trinity white cement for General Portland Cement Co., Chicago, Ill. Mr. Keatinge joined the Trinity Portland Cement Co. in 1940, which later became the Trinity division of General Portland Cement Co., to establish a white cement business for the firm. He started selling white cement in 1925 for Atlas Portland Cement Co., St. Louis. Five years later he was appointed head of the white cement department of Universal Atlas Cement Co.

Elected President

ROBERT E. PFLAUMER has been elected president of the American-Marietta Co., Chicago, Ill. Formerly vice-president, he succeeds H. J. Hemingway, who has resigned. Ray L. Oughton, who has been serving as executive vice-president, was named vice-chairman of the board.

Jaycee President Retires

DAIN J. DOMICH, controller of the Brighton Sand and Gravel Co., Sacramento, Calif., has retired as president

Dain J. Domich

of the U. S. Junior Chamber of Commerce. He joined the Sacramento chapter in 1945, shortly after becoming associated with the sand and gravel firm, and during the past eight years has served as chairman of most of the chapter's major activities. Mr. Domich was selected Sacramento's Outstanding Young Man of the Year in 1950 when he was serving as president of the Sacramento chapter. In 1952, he was elected vice-president of the U. S. Junior Chamber of Commerce in charge of personnel. Born in Sacramento, Calif., Mr. Domich attended public schools and then had two years of extension work at the University of California. He joined the U. S. Army in 1941, was commissioned a second lieutenant in 1942 and was discharged with the rank of captain in 1945, when he joined the Brighton Sand and Gravel Co.

Receives Award

ALBERT T. GOLDBECK, engineering director, National Crushed Stone Association, Washington, D. C., was honored recently at the 57th annual meeting of the American Society for Testing Materials when he received the first Frank E. Richart Award. This award was established in 1954 and is given for outstanding contributions in research and standardization in concrete and concrete aggregates. Mr. Goldbeck, after graduating from the University of Pennsylvania, Philadelphia, Penn., became an instructor at the University and also at Lafayette College, Easton, Penn. He has written many technical papers dealing with investigations in materials and in highway and bridge design. Mr. Goldbeck has been engineering director of N.C.S.A. since 1925.

Association Officers

MELVIN E. RAID, a partner of Raid Bros. Construction Co., Denmark, Iowa, has been elected president of the Iowa Agricultural Limestone Association. Wood W. Weaver of Weldon Bros., Iowa Falls, was named vice-president, and Clint A. Allen was re-elected executive secretary. New directors include Paul M. Nauman, treasurer of the Dubuque Stone Products Co., Dubuque, Iowa; Hollis Miller, Grundy Center, and Gene McClain, Allerton. Robert M. Koch, executive secretary of the National Agricultural Limestone Institute, was guest speaker.

Division Manager

JAY P. NICELY, formerly general commodity manager, has been appointed manager of the new Chicago sales division of National Gypsum Co., Buffalo, N. Y. John C. Calhoun

Jay P. Nicely

has been named manager of the Milwaukee district; Wayman W. Smith, manager of the Oklahoma district; and William E. Wright, manager of the Chicago district.

Association President

RUSSELL THORSTENBERG of Thorstenberg & Tamborello, Houston, Texas, was elected president of the Texas Aggregates Association at its recent annual meeting in Austin. He succeeds John H. White, general manager of White's Uvalde Mines, San Antonio. John H. Langston, Servtex Materials Co., New Braunfels, was elected vice-president; and G. O. Rogers, Travis Materials Co., Austin, secretary. Directors are W. D. Bryson, Panhandle Gravel Co., Amarillo; John H. White, White's Uvalde Mines, San Antonio; H. M. Lacy, Gifford-Hill & Co., Dallas; C. A. Chipley, Fordyce Gravel Co., San Antonio; George G. Smith, Texas Construction Materials Co., Houston; and Houston Clinton, Houston Clinton & Co., Burnet.

Operating Consultant

MEREDITH BOVEE has been appointed general operating consultant of The General Crushed Stone Co., Easton, Penn. He was formerly general superintendent and will be succeeded by Edwin E. Dotter, assistant general superintendent. J. K. Scott has been appointed district sales manager of the Rochester, N. Y., territory. Formerly assistant district sales manager, he succeeds George E. Schaefer, who remains in active service as district sales engineer. John C. Hayes, superintendent of the Corning, N. Y., plant, has been appointed assistant to Mr. Scott. Harold Hickox, formerly of the Watertown, N. Y., plant, has been named acting superintendent at Corning.

General Manager

E. LUDWICK has been appointed general manager of the aggregates operations of Southern Pacific Milling Co., Santa Barbara, Calif. He will supervise the Paso Robles crushed stone and ready-mixed concrete plants. Ross Knoeppel remains as manager of the crushed stone plant and O. E. Wright as manager of the ready-mixed concrete plant. Mr. Ludwick was formerly manager of the firm's lumber division in Paso Robles.

Engineers Club President

E. W. BAUMAN, managing director, National Slag Association, Washington, D.C., has been elected president of the Engineers Club of Washington, D.C. Mr. Bauman has long been active in A.S.T.M. technical work, serving on Committee C-9 on Concrete and on Committee D-4 on Road and Paving Materials. He is also active in the A.S.T.M. Washington District Council.

Association President

JOHN T. PENNACHETTI, president of the Thorold Concrete Block Co., Ltd., Toronto, Ont., Canada, was recently elected president of the National Concrete Products Association of Canada. He was formerly vice-president of the association.

Named Treasurer

CARL A. BLEUDORN, president and general manager of the Zeidler Concrete Products Machinery Co., Waterloo, Iowa, has been elected treasurer of the Iowa Engineering Society.

On Research Staff

JEAN B. BOND, formerly with the phosphate division of Monsanto Chemical Co., St. Louis, Mo., has been transferred to the Nitro plant as a member of the research staff. Mr. Bond holds B.S. and M.S. degrees in chemistry from Duke University, Durham, N.C., and is a member of the American Chemical Society. K. Warren Easley has been named technical representative in the Washington, D.C., office, succeeding J. P. Ekberg, Jr., who has been appointed assistant to Charles Allen Thomas, president of Monsanto Chemical Co. A native of Troy, Mr. Easley joined the company as an analytical chemist shortly after graduating from Purdue University, Lafayette, Ind.

Named Vice-President

CHRISTIAN F. BEUKEMA has been named vice-president of the Michigan limestone division of United States Steel Corp., New York, N.Y. He has been general manager of operations of the division for the last year. Mr. Beukema joined the division in 1940 after graduating from Michigan State College with a degree in civil engineering. After four years of Army service, he rejoined the division as construction engineer. In 1949, he was transferred to U.S. Steel as special assistant to the vice-president of raw materials and in 1951 was named director of planning on long-range iron ore development. He returned to the Michigan limestone division a year ago.

Association President

WALTER J. STEINER, owner of Steiner's Sand and Gravel, West Milton, Ohio, was elected president of the Ohio Sand and Gravel Association at a recent meeting in Columbus. He succeeds Gilbert R. Fuller, vice-president in charge of sales, Portsmouth Sand and Gravel Co., Portsmouth, Ohio. Charles Alley, vice-president, treasurer and general manager of The F. H. Brewer Co., Lancaster, Ohio, was elected vice-president; Claude L. Clark was named secretary, and Walter E. Pohlman, manager of the Columbus plant of the American Aggregates Corp., Greenville, Ohio, was elected treasurer.

Receives Award

FORD J. TWAITS, chief executive of Ford J. Twaits Co., Los Angeles, Calif., was recently presented the Construction Industries Sixth Annual Achievement Award, sponsored by the Construction Industries Committee of the Los Angeles Chamber of Commerce. Mr. Twaits, founder of the Southern California Chapter of Associated General Contractors, which he served twice as president, is a member of the Consulting Constructors' Council of America. At one time he was president of Consolidated Rock Products Co., a director of the National Sand and Gravel Association and a member of the National Code Authority of Aggregate Industries.

A.S.T.M. Award

DIRECTORS OF the American Society for Testing Materials, Philadelphia, Penn., have established the Frank E. Richart Award in honor of Prof. Richart who was senior vice-president of A.S.T.M. when he died in 1951. He was also an honorary member of the Society and chairman of Committee C-9 on Concrete and Concrete Aggregates at the time of his death. The award is to be given every three years.

Vice-President and Manager

C. WILBUR MARSHALL has been appointed vice-president and manager of the Virginia division of Lone Star Cement Corp., Richmond, Va. He succeeds Dwight Morgan who has retired after 31 years of service. Mr. Marshall joined the company in 1926 as a sales representative in South Carolina and became Virginia division sales manager in 1939. Curtis Jernigan, who has been with Lone Star since 1935, succeeds Mr. Marshall as division sales manager.

Soil Chemist Retires

FIRMAN E. BEAR, chairman, soils department, Rutgers University, New Jersey Agricultural Experiment Station, New Brunswick, N.J., will retire June 30 of this year and Russell B. Alderfer, professor of soil technology at Pennsylvania State College, will succeed him. Dr. Bear is one of the earliest and staunchest friends of the agricultural lime and limestone industry. Many years ago he was with the Ohio Agricultural Experiment Station. Numerous articles by Dr. Bear on the subject of agricultural limestone have been published in ROCK PRODUCTS.

Foundation President

FRANK B. WARREN, president of the Bessemer Limestone and Cement Co., Youngstown, Ohio, was elected president of the Greater Youngstown Area Foundation at a recent meeting of its executive committee. Mr. Warren has been especially interested in the Foundation's new industries program which has aided in bringing more than 300 smaller firms to the Youngstown area.

Elected Vice-President

LEE B. GODFREY has been elected vice-president of the Signal Mountain portland cement division of General Portland Cement Co. He succeeds L. Hardwick Caldwell who has resigned but will continue as a member of the board of directors. A graduate of the University of Chattanooga, Mr. Godfrey joined the Signal Mountain division as a sales representative in 1925. He was appointed assistant sales director in Chattanooga in 1945 to succeed the late W. H. Timothy. In 1947, he was named sales director, succeeding the late Irving F. Sisson, which position he still holds.

Vice-President of Sales

HAROLD R. DANNHAUSEN has been elected vice-president in charge of sales for the Chicago district of Consumers Co., Chicago, Ill.

Plant Manager

ALVIN J. BRAUN has been appointed plant manager of Atlas Ready-Mix, Inc., Bismarck, N. D. He was recently named secretary-treasurer.

Superintendent Retires

CHRIS KNUDSEN, plant superintendent of the Nelsen Concrete Culvert Co., Champaign, Ill., has retired after 31 years of service.

OBITUARIES

NICHOLAS S. SOLIMANDO, owner of the N. Sullivan Cement Block Co., Port Leyden, N. Y., died on May 9. He was 59 years old. Mr. Solimando formerly operated a sand and gravel business in Rome, N. Y.

FRANK A. LIND, a member of the Altoona Concrete Products Co., Altoona, Penn., died suddenly on May 31. He was 64 years of age.

GLENN R. DUMOND, superintendent of the Standard Portland Cement Division of the Diamond Alkali Co., Painesville, Ohio, died May 31 after a short illness. He was 60 years old and had been associated with the company for 40 years.

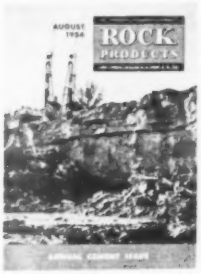
HARRY G. PFEIL, former president of the Iron City Sand and Gravel Corp., Pittsburgh, Penn., died June 2 in San Diego, Calif., where he had resided for the past 25 years. He was 73 years of age. Mr. Pfeil's father, Philip M. Pfeil, was one of the founders of the company.

H. VERNON FITZ, assistant southern sales manager of the Birmingham, Ala., office of the Alpha Portland Cement Co., Easton, Penn., died suddenly on May 27, after a short illness. Mr. Fitz had been associated with the Birmingham office since 1928, at which time the Birmingham plant was acquired from the Phoenix Portland Cement Corp.

INDUSTRY NEWS

Cover Illustration

THIS MONTH'S COVER illustration shows a section of the extensive quarry face at Marquette Cement Manufacturing Co.'s Oglesby, Ill., plant. This company has experienced a very rapid expansion in operations during recent years by the installation of additional production facilities at existing plants and through purchase of other cement companies, the most recent acquisitions being the Superior, Ohio and the Rockmart, Ga. plants.



The Oglesby quarry illustration appeared on the inside cover of Marquette's 1953 annual report. This company has won an "Oscar" for 11 consecutive years for the best cement industry report. In 1948, it won the Gold Oscar for its 1947 report which was judged as the best report of any industry in the contest. Awards were made by *Financial World* with the judging done by an independent board of judges.

In that particular portion of the Oglesby quarry shown, the overburden is relatively low, 15 ft. Elsewhere it ranges from 15 to 110 ft. The 2-in. drill rig is mounted on an RD-8 Caterpillar tractor, and is drilling 30-ft. holes here. The illustration was taken in the Fall of 1953.

Synthetic Silicate Plant

JOHNS-MANVILLE CORP. has started construction of a new plant at Lompoc, Calif., for the production of synthetic silicates from diatomite. Site of the new plant is adjacent to present Johns-Manville operations where diatomite is quarried for a number of other industrial uses. The diatomite deposit at Lompoc is claimed to be the world's largest and purest deposit. Synthetic silicates will be manufactured directly from crude diatomite by reaction with lime or magnesia under pressure. The product will be used as inert absorbents, bulking agents or extenders in paints, rubber, paper, cleansers, insecticides, fertilizers, dry cleaning, petroleum, and many other fields. The new plant is expected to be in operation within 18 to 24 months. Johns-Manville reportedly plans to spend about $18,500,000 this year on expansion and improvement projects.

Frank Grant, (left), chief electrician at Calaveras Cement Co.'s San Andreas plant, receives gold watch at annual company picnic for completion of 25 years of service. **William Wallace Mein, Jr.,** president, makes the presentation

Calaveras Annual Employe Picnic

CALAVERAS CEMENT CO., San Francisco, Calif., recently held its annual barbecue picnic with over 1400 employes, their families and friends participating. The picnic was held at "Frog Town," the site of Calaveras County's world-famous annual jumping frog jubilee.

Highlight of the picnic was the presentation of a gold watch to Frank Grant, chief electrician at the company's San Andreas plant, in recognition of his completion of 25 years in the service of the company. The presentation was made by William Wallace Mein, Jr., Calaveras president.

Cement Import Firm

DIESCHBURG & CIGRANG LTD., Montreal, Que., a subsidiary of Dieschburg & Cigrang Ltd., Antwerp, Belgium, was recently incorporated in Montreal for the purpose of importing Belgian and German portland cement to Canada. Steel and other building products from Europe will also be handled by the new import firm which is headed by Andrew Scipio of Montreal. The portland cement will be shipped directly to some of Canada's smaller ports, particularly in the Labrador, Hudson Bay and North St. Lawrence regions. The cement will be made specifically to comply with Canadian construction codes and requirements.

Rapid Tax Amortization

HURON PORTLAND CEMENT CO., Detroit, Mich., and Peerless Cement Corp., Detroit, were recently granted certificates of necessity by the Office of Defense Mobilization, authorizing rapid tax amortization for new or expanded industrial facilities.

Huron Portland Cement Co. was issued four certificates, allowing it to write off 35 percent and 60 percent of portions of $7,252,368 at the fast rate, covering investments in new cement production and storage facilities at Alpena and Muskegon, Mich. Peerless Cement Corp. was issued two certificates for a 60 percent fast tax write-off of $3,741,454 for portland cement production facilities at Port Huron and Detroit, Mich.

The O.D.M. issues certificates of necessity to encourage expansion of industrial capacity to produce defense and defense-related goods and services. A plant operator receiving a certificate is permitted to deduct the initial cost of his facilities from his taxable income at a faster rate than normally allowed by the government, thus reducing his income tax burden during the early years of operation.

Installs Second Lime Kiln

THE PAUL LIME PLANT, Douglas, Ariz., recently completed installation of a second rotary kiln which is expected to increase lime production by 80 tons per day. The new 7½- x 110-ft. kiln is of a forced-draft type. The other kiln, in operation since 1952, uses natural draft. The older kiln, which is 7- x 160-ft., is said to be the largest rotary kiln for lime production in the state. The company recently opened a new quarry at Bisbee, Ariz.

Crushing Plant

H. L. WILSON AND SON, Florence, Kan., has opened a stone quarry and crushing plant on the Fred Taylor property east of Florence. Roadstone and agricultural limestone are the major products.

Robert W. Marvin (right), chairman of Dravo Corp.'s Junior Board of Directors, presents awards to the top winners of the company's 15th annual technical papers contest. Receiving the awards are, left to right: E. M. Hays, $200 third prize; C. W. Granacher, $300 second prize; and W. L. Price, $500 first prize.

Technical-Paper Awards

Dravo Corp., Pittsburgh, Penn., recently presented cash awards totaling $1200 to six company employes who wrote the winning articles in the company's 15th Annual Technical Papers Competition. The purpose of the annual competition is to stimulate preparation by Dravo personnel of articles and papers for publication in technical and trade journals, or delivery before engineering societies.

The first prize of $500 was awarded to W. L. Price, engineering manager, Dravo's Keystone Div., for his paper describing a new floating plant to process sand and gravel by the heavy media method. Mr. Price's paper, which was the only one in the rock products industry, has appeared in several technical and trade journals. (See ROCK PRODUCTS, April, 1953, issue, p. 96.).

The other award winners were: C. W. Granacher, project engineer with The Contracting Div.; E. M. Hays, sales engineer, Engineering Works Div.; R. R. Ewart; D. A. Booth, general mechanical superintendent of the company's Neville Island machine and mechanical shops; and W. A. Walton, manager of Dravo's San Francisco, Calif., office.

Portland Cement Production

THE PORTLAND CEMENT INDUSTRY produced 21,709,000 bbl. of finished cement during April, 1954, as reported by the Bureau of Mines. This was a decrease of about ½ percent compared with the April, 1953, output. Mill shipments totaled 23,567,000 bbl. in April, 1954, an increase of 13 percent over that of April, 1953, while stocks were 9 percent higher than for the same month of the preceding year. Clinker production during April, 1954, amounted to 21,593,000 bbl., a decrease of 1 percent from the April, 1953, figure. The production of finished cement during April, 1954, came from 156 plants located in 37 states and in Puerto Rico, compared with 155 plants producing 21,802,000 bbl. during the month of April, 1953.

Ideal Expansion

IDEAL CEMENT CO., Denver, Colo., has completed installation of an additional finish-grinding mill at its San Juan Bautista, Calif., plant. According to a report on this plant addition, the new unit was installed to facilitate the handling of a greater quantity of cement during heavy demand periods. The company also announced the production of a new type of cement, called "Ideal High Plastic Cement." The new product, developed at the company's recently completed $500,000 research center at Fort Collins, Colo., is said to be especially suitable for stucco construction.

Opens Plant

WESTERN MINING CORP. has started operation of its new vermiculite and perlite processing plant at Nampa, Idaho. Plant capacity is 50 tons of "Micalite" per 8-hr. shift. Vermiculite ore is obtained from near Bozeman, Mont., and perlite from Owyhee County, Idaho. The plant will service an area extending from Baker, Mont., Lovelock and Wells, Nev., and Idaho Falls, Montpelier and Grangeville, Idaho.

Pakistan Cement Plant

THE FIRST SECTIONS of a $5,000,000 cement plant being supplied by Canada to Pakistan under the Colombo Plan have now been shipped from Montreal, Que., as recently reported in *The New York Journal of Commerce*. They include ten units of the kiln shell, weighing some 1200 tons. Five companies are joined in an enterprise named Canadian Overseas Projects, Ltd., which is handling this project.

Gravel Plant

REDDING SAND AND GRAVEL CO., Redding, Calif., newly incorporated, has started construction of a sand and gravel, ready-mixed concrete and "hot-mix" operation, to cost approximately $390,000. The plant will be located near the Sacramento River on the site of the former Columbia Construction Co. gravel plant, one-time source of building material for Shasta Dam. Cost of the sand and gravel division, which will have a 200-t.p.h. capacity, is estimated at $140,000. The ready-mixed concrete operation will cost about $125,000 and have a 62 cu. yd. per hr. capacity. Officers of the new company are J. H. Trisdale, president; M. W. Brown, vice-president; and W. K. Adams, secretary-treasurer.

Irish Cement Plant

BRITISH PORTLAND CEMENT MANUFACTURERS, LTD., recently placed in operation at its Magheramorne, Ireland, plant a new 300-ft. kiln and 250-ft. high prestressed concrete chimney, believed to be the highest of its kind in the world. The new installations, which have been under construction for the past year, are a part of the company's $4,000,000 expansion program. When completed, this plant, largest in Ireland, is expected to increase cement production from the present 3250 tons weekly to 6000 tons per week.

Lightweight Aggregate Plant

BAUKOL-NOONAN, Crosby, N. D., has opened a new plant at Crosby for the production of a lightweight aggregate made from clay obtained from the company's present mine property. Some new equipment was added although much of the company's existing equipment is being utilized for the new operation. Cost of the plant was estimated at about $150,000. President of the company is Robert Rovelstad.

Stock Increase

SHAREHOLDERS of Missouri Portland Cement Co., St. Louis, Mo., have approved an increase in the authorized capital stock to 500,000 shares, from the 300,000 previously authorized. No issuance of additional shares is contemplated for the present, however. Of the $25 par capital shares presently authorized, 299,284 are issued, of which 294,131 are outstanding, with the remainder in the company treasury.

Explosives Consumption

CONSUMPTION of industrial explosives in the United States reached a new record in 1953, as reported by the Bureau of Mines. A total of 790,810,690 lb. of all types of industrial explosives were used, which was an increase of a little more than 3 percent over the previous record year of 1952 when the total was 764,718,364 lb.

The larger consumption of industrial explosives was said to be due to the increased use of high explosive other than permissible, granular black blasting powder, and liquid oxygen. The 5 percent increased use of high explosives other than permissible was from the greater consumption by metal mines, railway and other construction work, and quarries and non-metal mines. The use of granular black blasting powder increased 33 percent over the previous year, largely because of a great increase in its use for railway and other construction work.

The coal-mining industry continued to be the principal consumer of industrial explosives, using 32 percent of all explosives sold in the United States in 1953, which, however, was a 3 percent decrease from the 1952 figure. The metal-mining industry used about 11 percent more explosives in 1953 than in 1952, representing 21 percent of the national total consumed.

Quarries and non-metal mines used 176,985,037 lb. of all types of explosives in 1953, or an increase of nearly 6 percent as compared with 1952. Among the large quarrying and nonmetal mining states, those for which increases were reported were: Michigan, Texas, Pennsylvania, Ohio and Iowa. The quarrying and non-metallic mining industries accounted for 22 percent of the U. S. total for 1953.

Monolith Cement Expansion

MONOLITH PORTLAND CEMENT CO., Los Angeles, Calif., has started an expansion and improvement program at its Monolith, Calif., plant, designed to increase plant capacity by about 1,000,000 bbl. of cement annually. Present capacity is about 8000 bbl. per day. By October 1, when the first phase of the program is completed, daily capacity will be up to 9000 bbl. Completion of the full program by early spring will raise capacity to 10,000 bbl. daily. New plant equipment will include additional kilns, a large slurry dryer, and a dust collecting system.

Cement Stock Offer

HERCULES CEMENT CORP., Philadelphia, Penn., reportedly expects to raise more than $1,000,000 for construction purposes by the sale of a 40,000-share block of its common stock. Company stockholders are being offered first chance for purchase of the shares on a 1-for-4-held basis. Stroud & Co. and associates reportedly will purchase any unsubscribed stock.

Pavement Yardage

AWARDS of concrete pavement for the month of June are listed by the Portland Cement Association as follows:

	Sq. yd. awarded During April, 1954
Roads	4,504,148
Streets and Alleys	3,826,046
Airports	2,141,334
Total	10,471,528

Cement Price Increase

THE PRICE OF CEMENT in the Columbus, Ohio, area was increased by 15 cents per barrel, effective as of July 1. The price increase is expected to affect the price of ready-mixed concrete, concrete block and all other building materials and operations using cement.

Changes Firm Name

THE OHIO HYDRATE & SUPPLY CO., Woodville, Ohio, has announced the change of its corporate name to Ohio Lime Co.

Coming Conventions

August 25-26, 1954—
National Sand and Gravel Association and N. R. M. C. A., Directors' Meeting, Manor Richelieu, Murray Bay, Quebec, Can.

September 20-22, 1954—
National Lime Association, Operating Meeting, Milwaukee, Wis.

September 20-24, 1954—
American Mining Congress, Annual Metal and Nonmetallic Mining Convention and Exposition, Civic Auditorium, San Francisco, Calif.

October 5-9, 1954—
A.I.M.E., Industrial Minerals Division, Annual Fall Meeting, Whiteface Inn, Lake Placid, N. Y.

October 18-22, 1954—
National Safety Council, 42nd Congress and Exposition, Conrad Hilton, Congress, Morrison and LaSalle Hotels, and Palmer House, Chicago, Ill.

October 20-22, 1954—
National Industrial Sand Association, Fall Meeting, Hotel Plaza, New York, N. Y.

October 25-27, 1954—
American Concrete Pipe Association, Fourth Annual Short Course School of Instruction, Statler Hotel, St. Louis, Mo.

October 28-29, 1954—
American Concrete Institute, Regional Meeting, Statler Hotel, Los Angeles, Calif.

Oct. 28-Nov. 2, 1954—
North Carolina Concrete Masonry Association, Annual Meeting, On Board the Swedish Liner "Stockholm" to Bermuda.

January 9-13, 1955—
National Ready Mixed Concrete Association, Silver Anniversary Convention, Miami, Fla.

January 9-13, 1955—
National Sand & Gravel Association, 39th Annual Convention, Miami, Fla.

January 24-27, 1955—
National Concrete Masonry Association, Convention and Exposition, Cleveland, Auditorium, Cleveland, Ohio.

February 7-9, 1955—
National Crushed Stone Association, 38th Annual Convention, Netherland Plaza Hotel, Cincinnati, Ohio.

HINTS AND HELPS

PROFIT-MAKING IDEAS DEVELOPED BY OPERATING MEN

Wind guides are horizontally spaced over belt conveyor at frequent intervals. Arrow points to roller, mounted about midway, which holds down belt when starting

Guides for Belt Conveyors

AT A NEW GROUND STORAGE STACKER ASSEMBLY, conveyor belts receive the material and deliver it to a double-armed stacker. Where the 36-in. belt goes up the ramp to the stacker, wind guides are provided. These consist of horizontal members spaced over the belt at frequent intervals. Also, a heavy roll is mounted about midway to help hold the belt down when starting. The stacker is also provided with special devices to keep it from damage during any possible hurricanes. This is accomplished by anchoring it to specially designed anchors embedded in concrete. Since the stacker travels over a rail length of about 1000 ft., the hurricane anchors are used only when weather reports indicate their need.

Guy-Line Assembly

IF A RAILROAD BANK or similar obstruction is hindering the installation of a desired guy-line, one solution to the problem is to do as one southwestern operator did — simply go through the obstruction by letting the line pass through a large-diameter pipe, as shown in the illustration.

Guy-line is installed through railroad bank by passing it through pipe

Lift Trucks Aid Plant Work

THE J. J. COLLINS CONCRETE PIPE AND STEEL CO., Portland, Ore., operates a plant at Ephrata, Wash., mostly for the production of poured concrete pipe. At the time of inspection, one of the old buildings of a nearby army air base was being used as a temporary plant structure. Aggregate for the concrete pipe was ground-stored near the plant, and a Wagnermobile scoop with a 25-ft. lift was used to pick up the aggregate and place it in the temporary wood bin, as shown in the illustration. A heavy-duty Yerlinger fork-lift truck was used for handling the heavier pieces of pipe. The unusual height to which this unit can lift makes it of added interest.

Scoop with 25-ft. lift places aggregate in temporary storage bin at pipe plant

Unloading Set-Up

THE ACCOMPANYING ILLUSTRATION shows how one ready-mixed concrete operator augmented his bulk-unloading facilities by installing a low receiving hopper between the car unloading hopper and the bucket elevator. The additional steel hopper is over the screw conveyor serving the bucket elevator, so that trucks can unload to it, or bagged cement can be dumped at this point in case of an emergency.

Low receiving hopper over screw conveyor serving bucket elevator augments bulk-unloading facilities

Material Handling

MODERN MATERIAL HANDLING methods reportedly have boosted production at the four plants of The Concrete Pipe Co. of Ohio, Inc., by as much as 30 to 50 percent. The accompanying illustration shows a fork-lift truck being used at the company's Cleveland, Ohio, plant to place an empty form on the turntable of a reinforced concrete pipe-making machine. The adjustable forks, which have an 83-in. spread, can accommodate any size form. The fork truck also removes the filled form from the pipe machine and takes it an average 75 to 130 ft. into one of the steam-curing rooms. The forms vary in size from those for 6-in. pipe on up to 72-in. pipe. In addition to shuttling filled and empty forms between the pipe machine and the curing rooms,

Empty form is moved into place on turntable of pipe machine by fork lift truck. Filled forms weigh up to 7000 lb.

the fork trucks are used to transport skid loads of cement, totaling 80-90 bags per load, and to move large coils of the welded steel wire mesh used to reinforce the pipe. The fork trucks used at the plants of The Concrete Pipe Co. of Ohio were supplied by Towmotor Corp.

Dual Burners

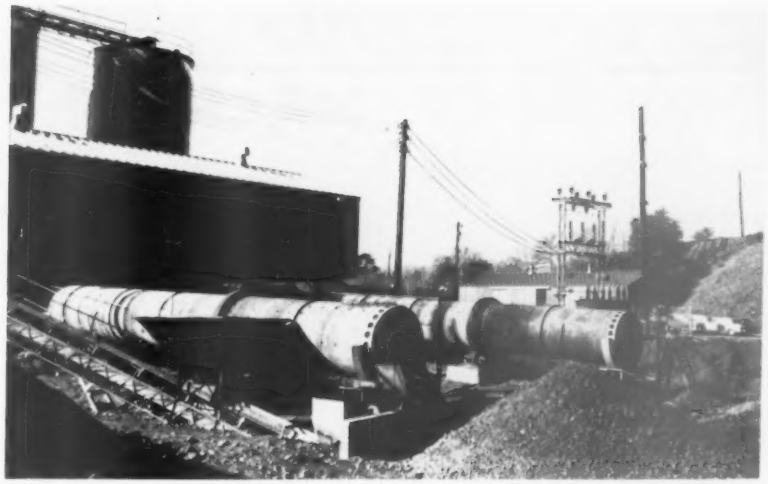
DUAL BURNERS on dryers or rotary kilns are used in the rock products industries to a considerable extent. This type of burner has been observed where either pulverized coal or natural gas was used. The twin burner adds flexibility to the operation, by permitting flames of different intensity, different flame directions, and different flame lengths. One flame can be above

Twin coal burners installed on kiln adds flexibility to operation, allowing flames of different intensity, direction and length

the clinker and the other directed onto the mass, or to keep a "hot bottom" in the kiln.

Cooler Installation

THE COOLERS shown in the illustration unload to a heat-resistant belt. The hopper at the left is used for reclaiming ground-stored clinker that is occasionally stored in the general area. The upper ends of the coolers have water sprays on the shell. The sprays were installed to help keep the room



Coolers, equipped with water sprays, are installed under kiln control room

above them cooler as the control panel for the operation of this section of the plant is housed in this structure.

Ramp Wall

RAMPS to a point above a primary crusher usually have a vertical retaining wall on the plant side. Some

Heavy concrete retaining wall serves as face for ramp used by drag scraper to deliver material to sloping reciprocating feeder ahead of scalper

observed have been of sheet steel piling, others of timber piling, and still others have cribbed fronts. Where trucks use the ramp as a roadbed, paved roadbeds have been frequent. The illustration shows an installation using a concrete retaining wall with a Sauerman drag scraper delivering material up the ramp to the primary operation.

Long Reclaiming Belt Take-up

IN THE ILLUSTRATION may be seen how a take-up on a long reclaiming belt conveyor was installed in a location where head-room was limited. It is a 30-in. belt conveyor operating in a 1100 ft. long concrete reclaiming tunnel. The travel distance of the take-up pulley appears adequate for this long belt. The belt is neoprene-covered so that flotation oils do not affect it.

Limited head-room for belt take-up near opening of reclaiming tunnel solved with this unique pulley take-up arrangement

NEW MACHINERY

Torque Limiter Couplings

MORSE CHAIN CO., 7601 Central Ave., Detroit 10, Mich., has introduced adjustable Torque Limiter-coupling units designed to provide overload protection for various machinery drives with direct-connected shafts. Combining the features of an adjustable slip-clutch overload device with those of a flexible coupling, the units are adaptable to motor drives with torque loads up to 260 ft. lb., including a direct-coupled motor or motor and speed reducer combination.

A friction disk with three integral lugs is clamped between two steel driving plates by the action of a Bellville spring tensioned by an adjusting nut. The driving plates are splined to a steel hub, and the hub supporting the limiter components is keyed to the shaft.

When the torque setting is exceeded through overload conditions, the friction disc breaks away from the driving plate and will then slip at from ⅓ to ½ the torque setting. The torque setting can be adjusted by the nut to provide overload setting up to the maximum rated capacity of the torque limiter.

Transmitter-Receiver

GENERAL ELECTRIC CO., Electronics Park, Syracuse, N. Y., has introduced radio transmitter-receiver combination units for operation at frequencies between 450 and 470 megacycles, to handle industrial applications where the lower frequency channels have become seriously crowded. Mobile models operate from either six or 12-volt batteries, with no adjustments necessary to revert from one to the other. Nominal output of these units is 20 watts. Station units have 40 watts output, and are rated for continuous duty. The receivers feature six-coil IF transformers, designed to provide a stability of selectivity to last the life of the equipment. High "Q" cavities at both receiver input and output insure against television interference.

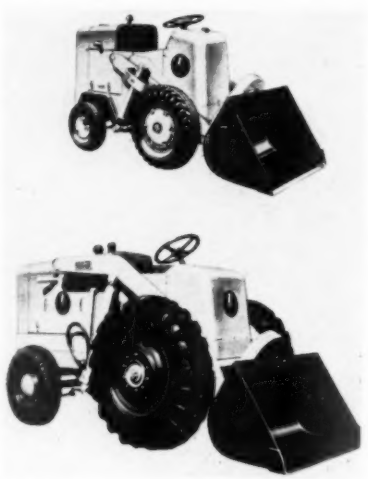
Rotary Arm Dust Collector

TURNER & HAWS ENGINEERING CO., INC., 87 Gardner St., Boston, Mass., has brought out the Model R Aeroturn dust collector designed on a rotary arm cleaning principle, and incorporating the principles of reverse-air-jet filtering. Dust collecting in pneumatic conveying systems operating under high pressure vacuum conditions is permitted due to the unit's cylindrical housing and continuous cleaning action. Dust enters the housing outside of the filter medium, the dust and dirt being filtered from the air as it passes from the outside to the inside of the cylindrical filter. Since the filter medium is supported by a perforated metal cylindrical cage, virtually all strength requirements of the filter are eliminated.

A continuously rotating vertical blow tube, passing between the supporting metal cage and the filter, cleans the filter medium. High pressure air is forced through a narrow vertical slot running the height of the blow tube, loosening the accumulated dust and dirt on the outside of the filter. The dust is blown into a receiver tube which rotates outside the filter medium and in synchronization with and opposite to the blow tube. From the receiver tube, the dust then falls into a hopper for continuous or intermittent removal. An electric motor drives both the rotating blow tube assembly and the positive displacement blower, used to supply the reverse-jet cleaning air. Normal operating capacities run from 300 to 10,000 c.f.m.

Water Conditioner

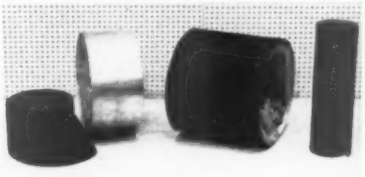
PACKARD MANUFACTURING CO., Packard Water Conditioner Div., Inc., 2220 W. Beaver St., Jacksonville 9, Fla., has announced a water conditioner which is designed to eliminate and prevent corrosion and scale formation in boilers and water systems, by imparting added energy to the atoms of the water solution. The unit has no moving parts and is said to require no expensive maintenance or servicing either in the form of labor or added chemicals. It is available in sizes handling from 6.5 to 1760 g.p.m.



Shovel-Loaders

FRANK G. HOUGH CO., 705 Seventh St., Libertyville, Ill., has introduced Models "HA" and "HAH" front-end shovel-loaders with torque-converter-drives as standard equipment. The "HAH" model is also equipped with

power steering. The torque converter is of the three-element, self-cooled type which automatically multiplies torque output of the engine in direct proportion to the load requirements. Under light-load conditions, it automatically reverts to fluid-coupling action. The converter acts as an oil cushion for the entire drive train, thus providing longer life and reduced maintenance. The "HAH" features four-speed, full reversing transmission with speed ranges from 0 to 23 m.p.h. The "HA" has a two-speed, full reversing transmission providing speeds from 0 to 11 m.p.h.

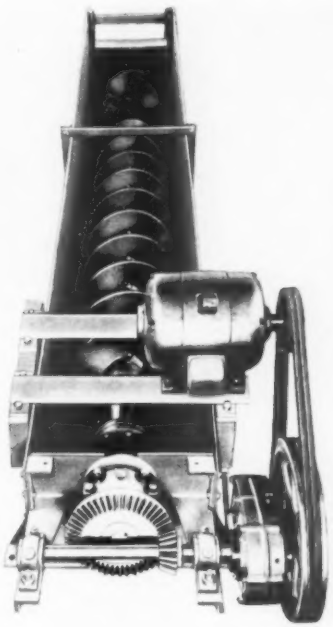


Pulley Surfacing

MINNESOTA MINING AND MANUFACTURING CO., 900 Fauquier St., St. Paul 6, Minn., has brought out "Safety-Walk," a waterproof non-slip surfacing, with a mineral coating of traprock, for use on industrial pulleys. The surfacing is available in two types "E" and "F," differing only in the method of application. Type "E" requires a separate adhesive and Type "F" has an adhesive backing. The traprock coating is designed to provide the required traction without harsh abrasive action on the belts or belt lacings. The surfacing is said to retard fire and resist oil, grease and water. It is available in rolls up to 24-in. wide.

Breaker Balls

EAGLE IRON WORKS, 216 Holcomb Ave., Des Moines, Iowa, has brought out breaker balls made of Ni-Hard, an abrasion resistant nickel-chromium iron. The balls are said to be less prone to spall, because of its high hardness and freedom from brittleness, and have less bounce upon impact due to low resilience. Pear shaped breaker balls are available in standard sizes of 1500, 2000, 3000, 4000 and 6500 lb., as well as special sizes. Spherical balls for use with an electromagnet are available in six standard sizes from 1275 to 6350 lb.

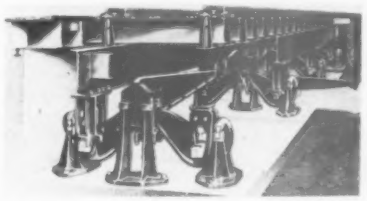


Screw Washer

MCLANAHAN & STONE CORP., Hollidaysburg, Penn., has developed the Model CM-1 coarse material screw washer for washing and/or dewatering gravel, crushed stone and similar materials of approximately 2-in. maximum size. It is available in single and double screw models, with flight diameters of 20, 24, 30 and 36 in. Capacities range from 60 to 185 t.p.h. in single screw models, and from 105 to 325 t.p.h. in double screw models. Features include: a fabricated steel washing box; cut steel bevel gears; abrasive-resistant, chilled iron flights; hardened steel paddles at the feed end to aid in breaking down foreign material lumps; grease-lubricated, antifriction bearings throughout; and provisions for adjustable overflow weir.

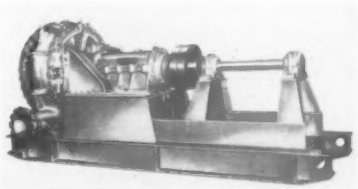
Power Take-Off Drive

STOW MANUFACTURING CO., 49 Shear St., Binghamton, N. Y., has developed a tractor trailer power take-off drive consisting of a 1¼-in. flexible shaft in combination with a square telescopic bar and tube. The flexible shaft is designed to absorb shock loads, increasing pump life. The telescopic rod acts as a disconnect coupling and also takes care of the change in length when the tractor trailer is jack-knifed. An 1800-in. lb. universal joint is used between the pump and the telescopic rod so that the flexible shaft will not bend severely.



Railroad Track Scale

THE HOWE SCALE CO., Rutland, Vt., has added a four-section, straight lever railroad track scale to its heavy duty line, featuring a patented wedge adjustment; platform double-bearing yoke; interchangeable alloy steel knife edges and bearings; and proper clearances of the suspension elements. Weight indicators which are available for the scales include: a recording or type registering beam for imprinting the weight on a ticket; a 77 DW-Weightograph featuring an automatic projection type of indication; a tape-drive, cabinet dial scale; the Mechanoprint weight recorder built in as an integral part of the tape-drive cabinet dial head; and the Teleprint electronic remote weight recorder which may be located 1000 ft. from the scale. The scales are available in 25 standard models with capacities ranging from 60 to 200 tons per section, and in various sizes and lengths. Sizes and capacities are also available to meet individual requirements.



Dredge Pumps

MORRIS MACHINE WORKS, Baldwinsville, N. Y., has announced the GA and GAF dredge pumps combining the lower speeds of the former model F, and the hydraulic design, and high heads of the former model G. The pumps incorporate a giant shaft and oversize bearings, a long-wearing impeller, heavy volute casing and right-angle bracing for positive alignment. Features claimed for the pumps include; durability, minimum horsepower, easy maintenance, thicker sections at points of great wear, good vacuum performance and a choice of various alloys.

Overall view of plant from pit. Truck hopper and feeder to main belt conveyor, to the right

Close-up of long conveyor from truck-dumping to scrubber. Material fed to conveyor by electric vibrating feeder

Scrubber Supplements Classifiers

By WALTER B. LENHART

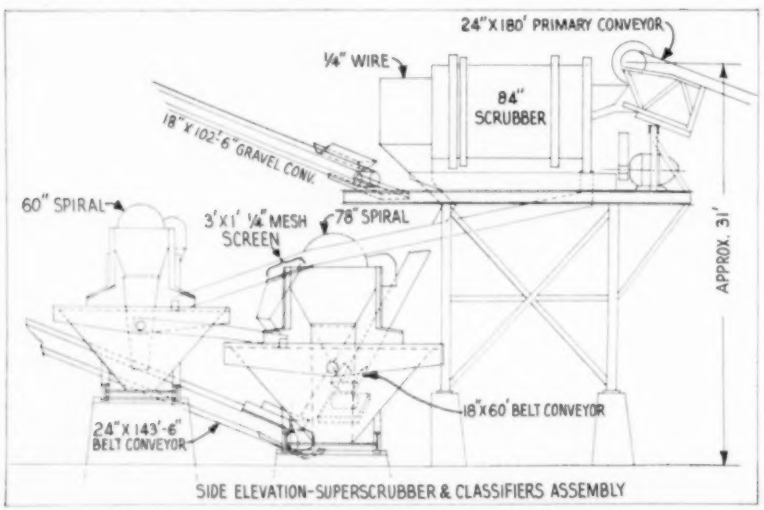
Mason-Dixon Sand & Gravel Co., Perryville, Md., studies 20 aggregate plants to secure ideas in building new plant

A NEW SAND AND GRAVEL PLANT was established recently at Perryville, Md., by the Mason-Dixon Sand & Gravel Co. About 20 sand and gravel operations were visited by company officials before undertaking this project, and the new plant was designed from ideas accumulated on the inspection trip and from general experience in handling materials. The plant has a nominal capacity of 250 t.p.h. The plant started during October, 1953.

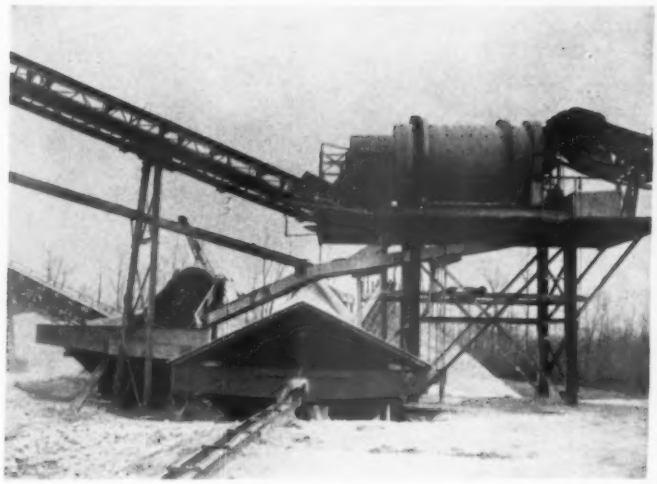
Perryville is about 28 miles south of Wilmington, Del., and the plant is immediately alongside Highway U. S. 40 that is the important link connecting Wilmington with Baltimore, Md. The company has a considerable acreage on the east flank of the highway that is relatively high in sand running about 80 percent sand to 20 percent gravel. The sand is clean and sharp, white in color, and practically all silica. It later may be processed for uses other than for commercial aggregates.

Stripping is nominal, and is mostly removed with a dozer blade. Material from a face about 25 to 30 ft. high is being sent to the processing plant although it was said there was at least 60 ft. of suitable material below the present working floor. Excavation in the pit is done with a No. 85 Link-Belt shovel that swings a 1½-cu. yd. bucket to load a fleet of three company owned General Motors and Ford rear-dump trucks. During emergencies a Hough Payloader has been used for pit excavation although in this event the bank run is usually loosened somewhat with a TD-18, International tractor and dozer. The haul to the primary truck hopper is short with a small rise near the bin. Trucks rear-dump to the hopper over which is a grizzly. A heavy-duty Syntron feeder moves material to No. 1 belt conveyor serving the 84-in. Telsmith scrubber. Over this belt has been suspended a scraper that lets practically all the material on the belt pass under it, but if any material in the 3-in. or larger range is on the belt, the scraper removes most of it. The oversize is mostly clay balls as there is very little plus gravel in the matrix.

The rotary scrubber is powered by a 75-hp. motor and has a short ¼-in. by 1-in. wire trommel on its discharge end. Also, a portion of the feed end of the scrubber has a screen section that is essentially a part of this end so that sand can be discharged from



Side elevation showing large scrubber and two sand screw units



Above: Sand plant with scrubber, upper right, and two sand recovery spirals. Covered spiral is for masons sand, and one to the left is for concrete sand

Right: Discharge end of fine sand screw has a flop gate so that more fines can be added to concrete sand, if desired

both ends of the scrubber. The scrubber is driven through a silent chain drive. It operates at 25 r.p.m.

Scrubbing and Screening

The size of the scrubber is designed to not only adequately scrub the gravel but also to clean the sand particles so the sand classifiers will operate more efficiently. The plant uses about 800 g.p.m. of water, and most of it goes into the scrubber for there is only one vibrating screen used in the entire set-up. It operates wet. The sand from both ends of the scrubber is collected by a launder. In the bottom of this launder is a 3 ft. long section (12 in. wide) of ¼-in. wire screen. This is designed to bleed some of the coarser sand into the masons sand recovery screw. The bulk of the pulp flowing down the launder goes to a 60-in. Wemco sand preparation machine that operates at 6 r.p.m. and is powered by a 10-hp. motor. This screw has a weir width of approximately 13 ft. with a total weir length of approximately 25 ft. It is a triple pitch spiral. Concrete sand from this screw falls to a 60-ft. stacker belt. The overflow from the 60-in. Wemco flows to a 78-in. single-pitch Wemco sand preparation machine that runs at 3.5 r.p.m. and is powered with a 10-hp. motor. This unit has a weir width of approximately 16 ft. and a total length of 32 ft. This spiral is covered for it is mounted under the discharge end of the scrubber. Covering the sand preparation machine prevents any gravel from falling into the screw. It also means a quieter pool during wind, rains, etc. The fine masons sand from the larger spiral falls to a 143½-ft. stacker belt. All conveyors are Barber-Greene. At the discharge end of the masons sand spiral a flop gate has been installed so that more fines can be blended into the concrete sand if desired. Thus flexibility in gradation of the sand is accomplished not only in the machines but ahead of them, and after them. Any fines from the lower deck of the single final screen is piped back to the launder from the scrubber to screws.

The final sizing screen is a 3- x 10-ft. Telsmith three-deck screen, operated wet, which has 2¼-in., 1¼-in., and $\frac{5}{16}$-in. wire decks, respectively. The materials from the screen fall to Butler truck bins below. The flow diagram gives additional details. All material from the plant is delivered by trucks and weighed on a pair of Howe truck scales. A Link-Belt clamshell and the Hough Payloader are used for reclaiming from ground storage. Most of the material is going into Wilmington and South Philadelphia areas where construction volumes are now said to be above normal and where crushed stone is the predominate aggregate. The plant is of steel construction throughout, and is laid out for efficient and economical operation.

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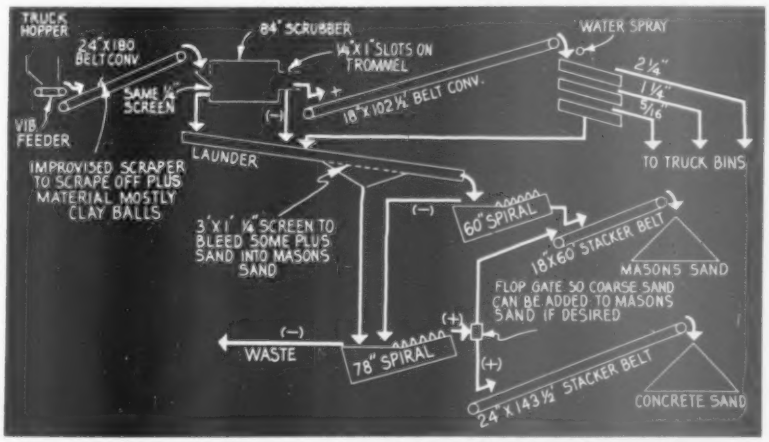
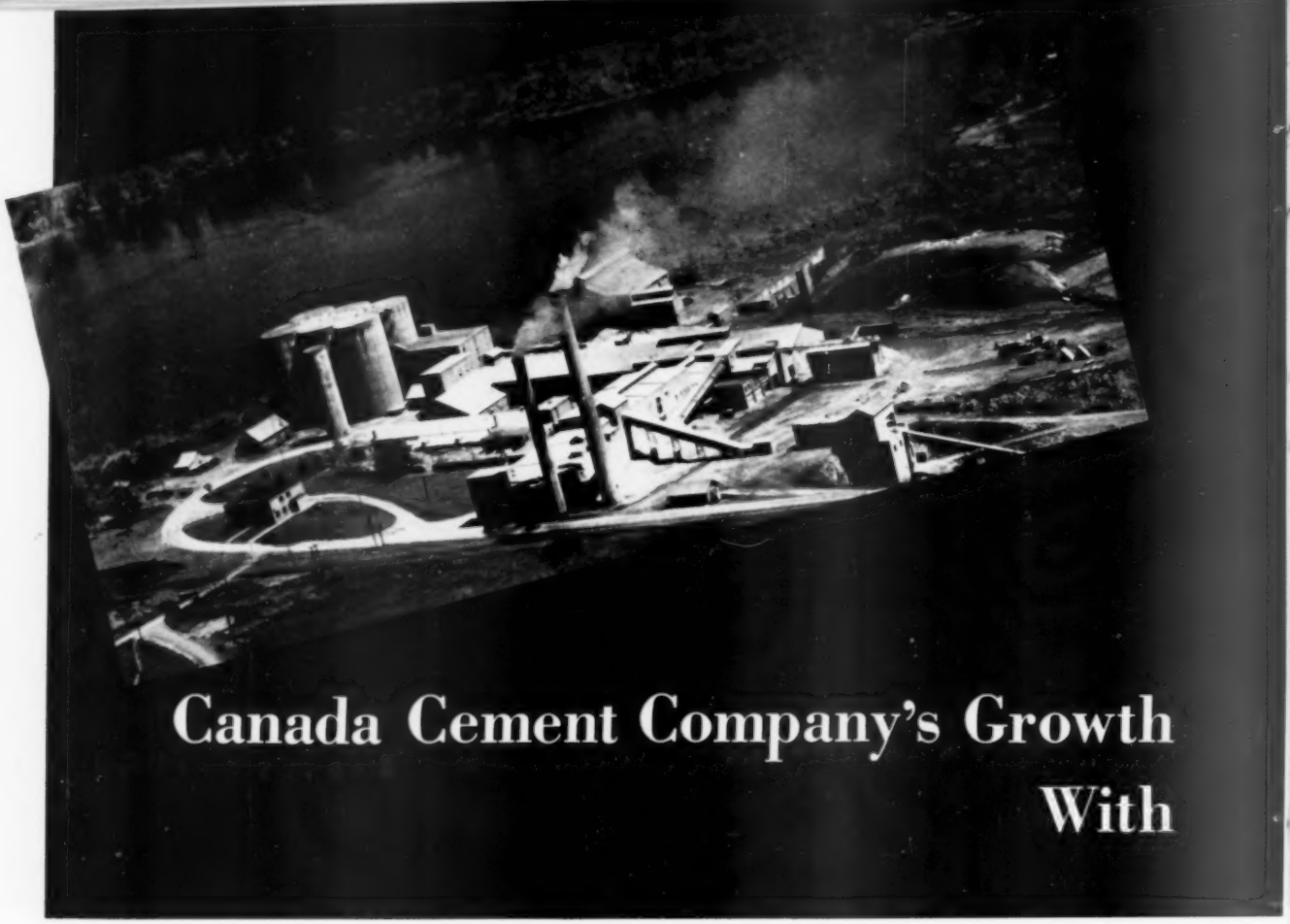
Sun Valley Rock & Sand Co., Tucson, Ariz., was recently incorporated by Claude D. and Lexton A. Downey.

Tri-Co Brikcrete, Inc., Westover, W. Va., has been incorporated with $10,000, by Merrill Roe Hood, Anna H. Taylor and Arlie Clyde Hood, all of Morgantown, W. Va.



Flowsheet of scrubbing, screening, washing and sand recovery operations



Canada Cement Company's Growth With

Upon completion of present program, Canada Cement Co., will have increased capacity over 90 percent since end of World War II

INCREASES IN DEMANDS for portland cement in Canada in the period from World War II through 1953 have been far greater, percentage-wise, than in the United States for the comparable period. In 1953, the rate of use had increased to 22 million barrels (a Canadian barrel is 350 lb.) for a population of 15 million, as compared to a requirement of 7 million barrels for 13 million people in 1945.

During that period, Canada has made great strides, in the construction of all types of concrete structures, which have been in advance of population growth. Construction of housing and roads, unprecedented industrial expansion and the building of hydro-electric power projects and defense plants have put most of the pressure on the portland cement industry through the post-war period. The ready-mixed concrete, concrete masonry and concrete pipe industries grew into substantial proportions during the period under consideration, and development of new uses for cement in the field of pre-stressed concrete and other applications have also contributed to the rapidly growing demand for cement.

Canada, like the United States, had a large backlog of housing and road-building accumulated during the war years which has taken considerable cement in the subsequent years. Hydro-electric power building projects in Ontario and Quebec principally, have taken about two million barrels of cement annually since 1949. Industrial expansion has been particularly heavy in Alberta, and defense construction has been substantial in all areas. Hydro-electric and defense construction took an estimated 30 percent of portland cement production in 1953, which was a peak year for the industry with production and sales some 19 percent in excess of 1952, the previous peak year. Whereas, demand for cement in Canada had shown an in-

Aerial view of dry process plant at Havelock, N. B. Raw and clinker storage buildings are just beyond stock with blending bins in front of stock; cement storage and packhouse in foreground; quarry and crushing plant in background

Keeps Pace Nation's Expansion

crease of about 100,000 bbl. per year since 1909, it has jumped more than a million barrels annually since 1945.

These unprecedented demands for portland cement have reflected in very substantial increases in productive capacity at existing mills throughout Canada and in the building of several new plants on the eastern seaboard. Plant building and the enlargement and modernization of existing mills has been a continuous procedure starting about 1947 and continuing to date. Whereas, the portland cement industry had operated at less than 70 percent of capacity before World War II, it has been running at peak ever since but, with new capacity coming into production, has never lagged behind demand more than five percent, according to estimates by leading cement manufacturers.

In 1951, some one million barrels of cement were imported into Canada from Great Britain, Belgium, Germany and the United States, but it is expected that domestic production will now be sufficient to meet all requirements in the foreseeable future. A moderate decline in construction is expected for 1954, as compared to 1953. Hydro-electric power projects and defense construction have declined but industrial building, housing and road construction are expected to continue at levels which will hold 1954 cement sales close in line with the 1953 record. Building of the St. Lawrence Seaway is estimated to require four million barrels of cement over a 4-year period. Plant building and enlargement still continue, which likely will result in productive capacity exceeding demand, but is being carried forward nevertheless to improve efficiency and in anticipation of an expanding industrial economy.

This article covers operations of Canada Cement Co., Ltd., which produces an estimated 80 percent of all Canadian portland cement, and which, by early 1955, will have increased its productive capacity by 91 percent. Capacity of this company's plants was 10 million barrels annually in 1945, it currently is 18.0 million barrels and will be 19.5 million barrels in 1955 with completion of a $10 million construction program now in progress.

Canada Cement Co.'s far-flung operations extend from the province

Overall view of Belleville, Ont. plant. Quarry is in background, new kiln building is to the right and the two older kilns have separate stacks. Ship-loading facilities in foreground

of Alberta in the west, across Canada to the Atlantic Seacoast, and shipments are made as far north as cement may be required. It has seven modern production units which will be discussed individually in this group of articles. They are located at Montreal East, Quebec; Havelock, New Brunswick; Hull, Quebec; Belleville, Ontario; Port Colborne, Ontario; Exshaw, Alberta; and Fort Whyte, Manitoba.

The Montreal East plant is one of the largest portland cement plants in the world with an annual capacity of 6.2 million Canadian barrels. It serves the large Montreal market and much of eastern Canada. Until the Havelock, N. B., plant was built in 1951, the requirements for the Maritime Provinces — New Brunswick, Prince Edward Island, Nova Scotia and Newfoundland — were shipped entirely out of the Montreal East mill and much of it by water. Cement from the latter mill continues to be shipped by rail or waterway as needed into the Maritimes.

The Hull and Port Colborne plants are single-kiln operations and are those least-effected by the company's postwar enlargement program. However, they have had their output enlarged through adoption of new practices to improve efficiency and have been kept at a high state of modernization. Those at Belleville, Ont., and Exshaw, Alberta, have undergone two major enlargements and the Fort Whyte (Winnipeg), Manitoba, plant is presently undergoing extensive rebuilding and enlargement. The Havelock operation is relatively new and Montreal East has been substantially enlarged in recent years.

Retail packing and distributing plants are operated at Halifax, Nova Scotia; Chatham, New Brunswick; Quebec City, Quebec; Toronto and Windsor, Ontario. Sales offices are located at Montreal, Quebec; Ottawa and Toronto, Ontario; Winnipeg, Manitoba; Calgary, Alberta; and Moncton, New Brunswick. Main headquarters of the company are at Montreal in a company-owned 10-story office building of reinforced concrete construction.

A subsidiary concern, Canada Cement Transport Ltd., owns and operates two self-unloading vessels which supply the five retail plants across eastern Canada during the shipping season. The S.S. Bulkarrier, a steam-driven, oil-fired vessel, has Montreal as its home port, transporting cement from the Montreal East plant to the retail plants at Halifax, Chatham and Quebec City. Gypsum from Nova Scotia is hauled on the return trip.

The E.M.V. Cementkarrier has its home port at Belleville, Ont., and supplies cement to the Toronto and Windsor retail plants. On occasion she picks up a cargo of Pennsylvania coal at Sodus Point, N. Y., for the return trip. This ship is much the newer of the two and is diesel-powered with a carrying capacity of 17,000 bbl. of cement. It is self-unloading, with a drag feeding to a boom and belt conveyor system for unloading coal and gypsum, and to a Fuller-Kinyon pump for discharging cement. On the average, cement is loaded at the rate of 3000 bbl. per hr. and unloaded at the rate of 1800 bbl. per hr.

• This group of articles on Canada Cement Co., Ltd., details the growth of the company, summarizes operating practices and describes the major plant installations completed since World War II. The company has had tremendous growth, and will have almost doubled productive capacity with completion of a new plant at Fort Whyte, Manitoba, in 1955.

Compilation of the data herein would not have been possible without the cooperation of company executives at Montreal and the help of operating officials at the mills inspected.

We wish to express our appreciation to J. Narsted, vice-president and manager of production, for his approval and support of our endeavor, and to thank General Superintendent V. C. Hamilton, Technical Supervisor of Operations, A. S. Dies, Chief Engineer H. B. Howe and the mill superintendents at the various plants for their generous help and cooperation.— The Editor

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Four silos at the Toronto retail plant provide storage for 90,000 bbl., and the other retail plants each have two silos holding 32,000 bbl. Each has packing machines.

Most of the production, however, is shipped by rail and, since World War II, the demand for bulk cement has more than doubled. Bulk shipments have increased from 25 percent of the total ten years ago to more than 50 percent. Truck shipments of bulk cement have also sharply increased.

Ottawa Valley Crushed Stone, Ltd., another subsidiary, produces commercial crushed stone in the Ottawa, Ontario, area.

All of the producing plants are wet process with the exception of the Havelock mill, which was built in an area where there was no suitable supply of water. There are 18 rotary kilns in operation, of which the smallest are three 10- x 278-ft. units, and the rest are in excess of 300 ft., ranging in size up to 12 x 450 ft. All are coal-fired except at Exshaw where natural gas is used and at Fort Whyte which has oil-fired kilns.

Production is of standard portland cement, high early strength portland cement and "Kali-crete," a sulfate-resisting portland cement. Little mill-ground air-entraining cement is produced in Canada. Mortar cement is being produced at Belleville, and it is anticipated that that product will soon be manufactured at other mills of the company.

Canada Cement Co. employs about 2000 people and some 95 percent of its employes own stock in the company. It has never experienced a strike and has an excellent safety record. The company has its own engineering department and does 95 percent of its own engineering work including basic layout and design for plant operations. Detail engineering is on occasion let out to engineering firms.

Canada Cement Co., Ltd., was established in 1909, taking over a number of cement plants scattered over Canada. Major rebuilding and consolidation of production facilities started in 1927. There were some 14 plants in all at the outset and some of them were soon closed. Most of the plants were dry process, with coal-fired kilns ranging in size from as small as 5 and 6 x 60 ft. up to a maximum of 10 x 150 ft.

All of the plants were inefficient by modern standards and the fuel consumption per bbl. of clinker produced averaged approximately 1,500,000 B.t.u. per bbl. They were very dusty and dirty operations. Available stone and clay were difficult to dry, blending was by necessity inaccurately done, there were no instruments and control of quality was poor. For reasons of dust and dirt and in the desire to effect good blending with fuel economy, the company launched into the building of plants with long, wet process rotary kilns, that established the company as a pioneer of the movement to long, wet-process kilns on the North American continent. The first long wet kilns were made by joining short kilns into two 10- x 278-ft. units at the Fort Whyte plant in 1928. An 11-ft. 3-in. by 10-ft. by 365-ft. Smidth kiln was installed at the Hull plant in 1929, to be followed by a succession of long kiln installations at each plant and then by others in the post-war II period.

Kilns in operation at the various plants prior to World War II included the aforementioned ones at Fort Whyte and Hull; four 11-ft. 3 in. by 10-ft. by 11-ft. 3-in. x 352-ft. kilns at Montreal East which were followed later by installation of an 9- x 8- x 9- x 324-ft. 4-in. kiln; a 10- x 278-ft. kiln at Exshaw; an 11-ft. 3-in. by 10-ft. by 11-ft. 3-in. by 430-ft. kiln at Belleville; an

Ottawa Valley Crushed Stone, Ltd., a subsidiary company, produces commercial crushed stone at this modernized plant near Ottawa, Ont.

11-ft. 3 in. by 10-ft. x 11-ft. 3-in. by 412-ft. kiln at Port Colborne. Clinker capacity was 10 million barrels annually from these kilns.

Capacity increases were accomplished according to needs as determined by long-range economic studies. The first major program embraced the 5-year period through fiscal 1950 and was effective in raising productive capacity from 10 million barrels annually up to 14 million barrels at a cost of $15,270,000. Major capital investments included installation of an 11-ft. 3-in. by 10-ft. by 11-ft. 3-in. by 430-ft. kiln (No. 6) at Montreal East to raise clinker capacity from 4.8 million barrels up to 6 million barrels annually; installation of a second kiln at Belleville identical to the first one (11-ft. 3-in. by 10-ft. by 11-ft. 3-in. by 430-ft.) raising annual capacity to 2,600,000 bbl.; and installation of an 11- x 300-ft. kiln at Exshaw, raising capacity of this plant from 800,000 bbl. to 1,600,000 bbl. annually. These three kiln installations were completed in the 1948-1949 period.

This program also embraced enlargements to the raw mill and finish mill departments to accommodate the increased clinker capacity at the respective plants. Dust collectors were installed at the Montreal East, Port Colborne and Hull plants under this program, and there was emphasis throughout all plants in increasing efficiency.

Then followed a 2-year program involving the expenditure of some $20 million, principally to again enlarge the Exshaw and Belleville plants and including the building of the new 800,000 bbl. dry process plant at Havelock, N. B. The latter project was completed in 1951 at a cost in excess of $6 million. An 11-ft. 3-in. by 430-ft. kiln (No. 3) increased capacity of the Exshaw plant to 3,000,000 bbl. annually in 1952, and capacity of the Belleville plant was raised to 4.0 million bbl. annually when a new 11-ft. 3-in. by 430-ft. kiln (No. 3) went into production in 1953. These additions raised total capacity to 18.0 million bbl. annually.

Such substantial enlargements of kiln capacity at Exshaw and Belleville necessarily required major rebuilding of other departments. Among installations required at Exshaw under this program were a new crushing plant with a 54-in. Traylor gyratory crusher and Pennsylvania impactors, a new raw storage, large ball mills to be operated as preliminary raw grinding units to be followed by secondary grinding through the existing Unidan mills, an air-quenching clinker cooler, a new clinker mill and the opening of a new quarry. A Joy heavyweight rotary drill and 22-ton Euclid trucks completed the installation.

At Belleville, installation of the third kiln required new storage facilities for stone, two additional wash mills in a new structure, a new raw mill, Unidan grinding mills and added clay and slurry storage basins.

Approximately $4 million was spent in fiscal 1953 to complete the 2-year program described and an additional $10 million was appropriated for the 1954 plant building and modernization program. The major item, now just underway, is doubling the capacity of the Fort Whyte (Winnipeg) plant to raise its capacity from 1.6 million barrels annually to 3.2 million barrels. It comprises the building of an entirely new mill with 12- x 450-ft. rotary kiln adjacent to the existing plant. This plant will be representative of the company's concepts of modern wet process plant design based on its many years of experience at its other plants. Extensions and improvements to the distributing plants at Quebec City and Toronto were scheduled for completion early in 1954.

Upon completion of the Fort Whyte plant in early 1955, the company will have attained a plant capacity of 19.5 million bbl. annually, broken down as follows:

Plant	Annual Capacity (bbl.)	Increased Capacity since 1945
Montreal East	6,200,000	2,300,000
Belleville	4,000,000	2,400,000
Fort Whyte	3,200,000	1,600,000
Exshaw	3,000,000	2,100,000
Port Colbourne	1,200,000	0
Hull	1,100,000	0
Havelock	800,000	800,000
	19,500,000	9,200,000

Capital costs for enlargement of capacity in Canadian cement plants are high in line with those prevailing in the United States. The average for new plant building is approximately $10 per barrel of annual capacity which is considered difficult to justify, considering that selling prices continue low compared to the prices for other building materials and because the trend in operating costs continues upward. Whereas the average prices of basic building materials have increased by some 165 percent, cement prices have increased by less than 50 percent during the post-World War II period. The cost per barrel of postwar added capacity in plants of Canada Cement Co. has been more near $7 per barrel by virtue of making most of the increased capacity in established plants that were modern production units to begin with.

There have been many factors, other than capital investment for plant enlargement, that have added materially to the ability of each plant to enlarge its output and to reduce its cost. In order to bring all plants up to standard, there has been complete conversion from rail haulage to large capacity trucks in all the quarries, general improvement and tightening up of kiln firing practices to increase the rate of clinker production from all kilns and to reduce kiln downtime, and many other changes to improve efficiency. These are to be discussed broadly in a separate article in this issue covering general operating practice, and are emphasized in more detail in other

articles discussing the separate production plants.

The Havelock, Exshaw, Belleville and Montreal East plants are covered in considerable detail in separate articles. Design and operating features of the Fort Whyte plant, now under construction, are also described, and we touch briefly on the Hull and Port Colborne plants which have undergone little change except in details.

Growth in productive capacity has reflected substantially in earnings of the company. Net profits in the 1928-1931 period averaged $1.5 million annually, declined in the depression years of the '30's and averaged $1.4 million annually during the 1937-1942 period. Following a decline to below $1 million annually in 1943 and 1944, the trend was sharply upward. Net profits exceeded $4 million for fiscal 1952 and jumped 34.9 percent to $5,454,000 in fiscal 1953 when production and sales increased 19 percent over the previous year.

Earnings per share increased by 615 percent from 1937 to 1947 and increased an additional 215 percent through the 1947-1951 period. Capitalization includes $4 million in bonds, $19,611,160 in preferred stock and includes 600,000 shares of non par value common stock. Fixed assets as reported to stockholders in the November, 1952, report were $66.8 million in land, buildings, plants and equipment, representing an increase of $32.6 million since 1947.

Officers of the company are J. D. Johnson, chairman of the board; J. M. Breen, president and general manager; J. Narsted, vice-president and manager of production; R. S. Aiken, treasurer; G. A. Luffman, secretary; and G. L. Darlington, assistant secretary-treasurer. V. C. Hamilton is general superintendent; H. B. Howe, chief engineer; A. S. Dies, technical supervisor of operations; and W. S. Weaver is chief chemist.

OPERATING PRACTICES of Canada Cement Company

• Pioneered long wet process kiln trend in North America. Plant operations reflect standardized practices and equipment. Some methods are a departure from United States' ideas

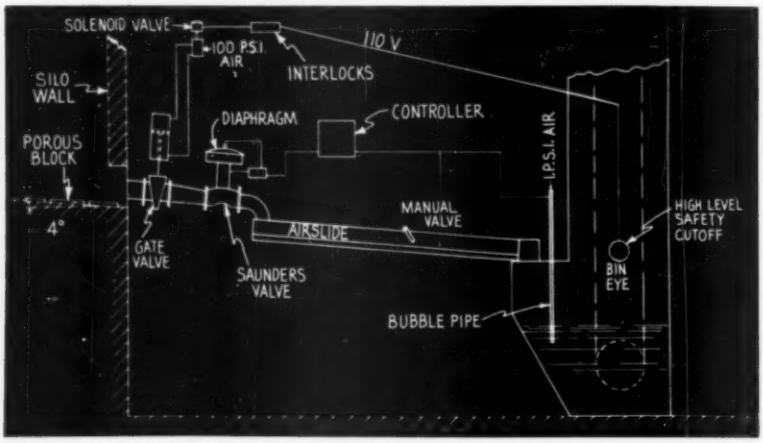
CANADA CEMENT CO., LTD. has had almost 30 years of experience in the operation of long, wet process rotary kilns of lengths ranging from 278 ft. up to 450 ft. Some of them have integral-type clinker coolers while others have separate air-quenching clinker coolers. It has kilns with straight shells in various diameters and some with restricted diameter calcining zones. With the building of the dry process Havelock plant (described elsewhere in this issue), it has deviated for the first time from its standard practice of wet process operation.

The company has come to certain conclusions as to equipment selection and operating practices based on its many years of experience in long-kiln operation. It has standardized on certain general operating features and on the selection of its major production units throughout but there necessarily are deviations from standard practices and plant layouts at the respective plants. There are many practices which are common to those in modern cement plants in the United States but there are also some differences in methods and some features that are unique.

Economic considerations and Canadian specifications for portland cement, being different in some respects than in the United States, are among the factors influencing operating practices. Water-generated electric power is generally very cheap by U. S. standards for power, at most mills but electric power is very expensive at Havelock where some purchased power is steam generated. Since hydroelectric power is relatively low in cost, there is no economic advantage to closed-circuit grinding of raw material in any of the company's wet process plants, where the practice is to grind to about 92 percent passing the 200-mesh sieve through multi-compartment mills without thickeners. The slurry is pumped into large mixing and storage tanks instead. Climatic conditions dictate that these tanks be provided with maximum protection in the form of buildings with substantial roofs.

At Havelock, where power is costly, both raw and finish mills are in closed circuit with mechanical air separators and carry large circulating loads. Finished cement is being produced at the creditable figure of about 22 kw.h. per bbl. at this plant.

Specifications for portland cement as written by the Canadian Standards Association differ principally from American standards in that a coarser ground cement is permitted. Fineness is measured on the 200-mesh sieve rather than by surface area, and standard portland cement as well as sulphate-resisting cement may have up to 18 percent retained on the 200-mesh sieve. High early strength portland cement has no fineness specification. Finish grinding continues to be done in open circuit at Port Colborne, Montreal East except for high early strength and in the present plant at Fort Whyte. All three standard cements are limited to 1.0 expansion in the autoclave. The purchaser may specify the type of strength test to be required and the specifications give



Schematic control system for drawing raw material from blending bins (Havelock)

consideration to performance tests of cements from various mills.

Chemically, the three standard portland cements are limited to 3 percent loss on ignition, 0.7 percent insoluble residue and 5.0 percent magnesia for standard and high early strength cement. Sulfate resisting cement has a 4 percent magnesia limit.

Practically all air-entrained concrete used in Canada is produced by adding the air-entraining agent to standard cement in the mixer. Mortar cement is relatively new and, thusfar, is produced only at the Belleville plant but provision is being made for its production in other mills. A substantial demand for such product is developing.

As stated earlier, the design of plants and reconstruction is accomplished largely by the company's own engineering staff. Plant building is usually done by local construction firms. Much of the equipment is standardized as to manufacturer but the company does not purchase equipment on the basis of price; rather, it often specifies that machinery have special design features that will contribute to continuity of production and cut enforced shutdowns to a minimum.

Much of the increased production attainable in recent years was due to general lightening up of operations and because stress on the prevention of downtime has been effective in improving the record. The problem of downtime is a subject of constant study and accurate records of all losses in production are kept. This is particularly so with the kilns, which are the key units insofar as potential production is concerned. Average downtime of the kilns for 1953 was 7 to 8 percent, which is lower than it had ever been before. Practice is to specify heavy-duty equipment such as sleeve bearings and drive elements that exceed their ratings, to provide higher than ordinary safety factors, require extra thickness in steel plate, extra heavy stiffening rings on kilns and other "over-design" features, recognizing that losses in production can be much more costly than the added costs of more sturdy machinery and equipment.

The company follows a practice of standardization as far as manufacturers of major basic equipment are concerned, insofar as it is practicable and advisable to do so. All rotary kilns, raw and finish grinding mills, air-swept coal-grinding tube mills, kiln control panels, slurry agitators, etc., are supplied by F. L. Smidth & Co., New York, N. Y., and are manufactured in Canada. Smidth has been selected to supply the major heavy machinery because of its wide experience as cement plant engineers and its accumulation of records in installations over the world.

New circular storage basin for slurry measures 80 ft. in diameter, and has a capacity for 12,000 bbl. of material. It features a gunite-constructed dome roof and rotating travelling agitator with compressed air supplied from agitator-mounted compressor. A similar basin was built for clay slip storage (Belleville)

Fuller Co. supplies all cement-pumping equipment with its related air compressors and Fuller-Huron Airslides for material handling. All slurry pumps are of Wilfley manufacture, most electric motors are of Canadian General Electric manufacture. Other equipment is covered later herein and in separate plant articles.

Kilns

Installation of the 10- x 380-ft. dry process kiln at Havelock was dictated by lack of a dependable supply of water or that plant undoubtedly would have been wet process. However, performance of the plant is considered good. The power requirement per unit of production is only slightly higher than for the wet process plants and the quality of cement is of the same high quality. Among reasons for complete conversion to wet process plants starting back in 1928, other than a desire to minimize dust and dirt, was that the clay at the several plant locations was difficult to dry and the wet process permitted more accurate blending for chemical control.

At Havelock, waste heat from the kiln is used effectively to dry both limestone and shale with considerable economy, and the use of air agitation in blending has proved as good as the wet process from the standpoint of chemical control. The mix is held consistently within 0.15 percent plus or minus the holding point, expressed in percentages of total carbonates. Heat requirement per barrel of clinker averages 900,000 B.t.u. which is 10 to 20 percent lower than for the wet-process kilns. These figures are based on forced operation.

Downtime for kiln rings and refractory failures has, on the other hand, been higher for the Havelock kiln, but experience with its operation and changes adopted in firing methods are bringing the downtime figures in line with the other kilns. Downtime because of kiln rings was 99 hr. in 1953 as compared to 240 hours for 10½ months in 1952. Total downtime of the kiln in 1953 was 11 percent as compared to 15.4 percent in 1952. Increasing the diameter of the coal pipe nozzle for a shorter flame, and increasing the primary air from 18 to 25 percent, to better condition the load for entry into the hot zone, plus greater knowledge of instrument control, have combined to lower downtime from rings. Most of total kiln downtime is due to refractory failures because of heavy scaling which, when it comes out, tends to chip off the brick. If it were not for the gummy nature of the clay at the various other plant locations, the experience at Havelock indicates that the dry process with long kilns might merit consideration in major plant building of the future.

As mentioned earlier, the company operates a great number of kilns of various sizes, some with straight shells and some with restricted calcining zones and others with integral-type clinker coolers. Based on its experiences with output and fuel consumption, the company prefers straight kiln

shells, direct-fired by air-swept tube mills where coal is the fuel and individual air-quenching clinker coolers. The major installation now underway at Fort Whyte will have a straight 12- x 450-ft. wet process rotary kiln (oil-fired) with Narsted horizontal air-quenching clinker cooler. Restricted diameter calcining zones are believed to disturb the flow of gases and retard output, according to this company's experience.

The following data provide a comparison of the performance of the various kilns:

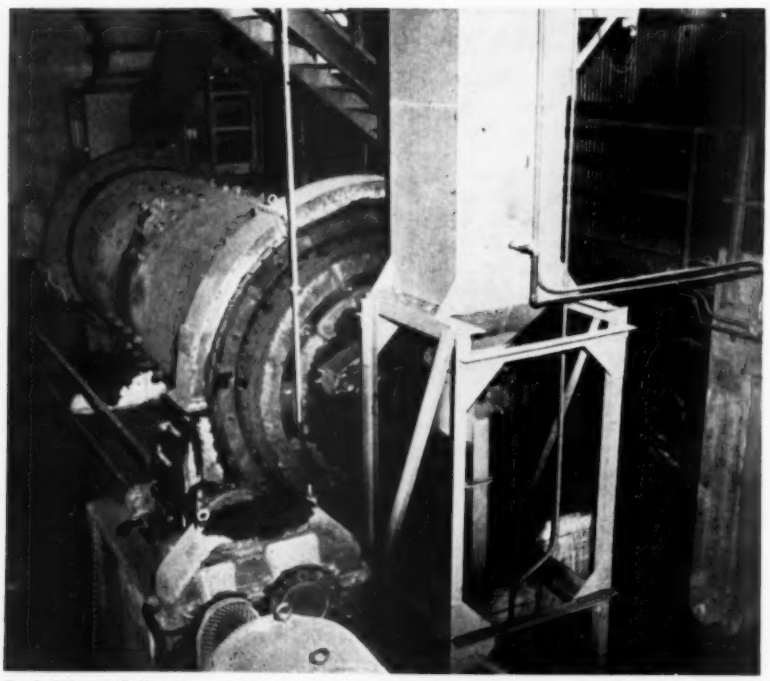
Plant	Size of kiln	Daily Production	Annual Production	Heat Requirement per barrel
Havelock	10 x 380 ft. (dry process)	2400 bbl.	800,000 bbl.	900,000 B.t.u.
Hull	*11'3" x 10' x 365'	3150 bbl.	1,048,000 bbl.	1,100,000 B.t.u.
Exshaw	(10 x 278 ft.	2200 bbl.)		1,250,000 B.t.u.
	(11 x 310 ft.	2350 bbl.)	2,900,000 bbl.	1,200,000 B.t.u.
	(11'3" x 430 ft.	4000 bbl.)		1,000,000 B.t.u.
Montreal East	*Four 11'3" x 10' x 11'3" x 352'	2850 bbl. each)		1,130,000 B.t.u.
	9' x 8' x 9' x 324'4"	2200 bbl.)	5,800,000 bbl.	1,130,000 B.t.u.
	11'3" x 10' x 11'3" x 430'	4100 bbl.)		1,000,000 B.t.u.
Belleville	*Two 11'3" x 10' x 11'3" x 430'	3750 bbl. each)	3,880,000 bbl.	1,101,000 B.t.u.
	11'3" x 430'	4150 bbl.)		
Winnipeg (Fort Whyte) (new plant)	12 x 450 ft.	4500 bbl.	1,485,000 bbl.	1,030,000 B.t.u.
Port Colborne	*11'3" x 10' x 11'3" x 412'	3200 bbl.	1,082,000 bbl.	1,160,000 B.t.u.

*The lengths of the kilns indicated are of the kiln exclusive of the integral coolers. The length of the Port Colborne kiln includes the extension.

In the foregoing, the kilns are being pushed over rated output for maximum fuel efficiency. The B.t.u. figures would be 10 - 15 percent lower if the kilns had been producing clinker at rates for maximum fuel economy. The Fort Whyte kiln figures are calculated and not based on actual operation. According to the kiln manufacturer, the figures would be 990,000 B.t.u. at a production rate of 4000 bbl. per day, and 902,000 B.t.u. at 3500 bbl.

Clinker Coolers

All the newer kiln installations (since 1948) are equipped with Narsted horizontal air-quenching grate coolers and others are being installed on older kilns. This cooler was developed by vice-president John Narsted and was first installed at the Montreal East plant. Clinker from the kiln is conveyed horizontally over a stationary grate by heavy cast steel drag bars. There are no sprockets or chains and the drag is operated hydraulically through a Vickers pump unit which permits varying the cooler speed. The wind box beneath the stationary grate is divided into two compartments. Preheated air from the forward cooler section enters the kiln as secondary air for combustion. The kiln hood is not tightly sealed around the kiln. Air in excess of that required for combustion is exhausted through a tube-type dust collector directly to atmosphere. The separate vent stack acts as a pressure regulator.



Each kiln at Belleville is direct-fired by an air-swept tube mill with preliminary drying chamber. Heated air is drawn from kiln hood to be swept through mill. Coal feed bin is in background

Narsted coolers are operated at the optimum speed for a thin bed of clinker with a constant volume of air put through the grate. The kiln takes the amount of air that it requires. There are no automatic features in the cooler installations of Canada Cement Co. like in some American plants where the grate speed is varied automatically to hold a constant secondary air temperature into the kiln. Burner pipes are air-cooled and the air for that purpose is supplied by a bleed pipe from the clinker cooler blower. Heated air for drying coal in the grinding mills has thus far been taken from the kiln hoods but one installation takes hot air for the unit coal pulverizer from the side of and adjacent to the feed end of the cooler. It is believed that the lower velocity air coming up through the cooler throat will provide a better burning condition in the front of the kiln and simplify the maintenance of hood lining.

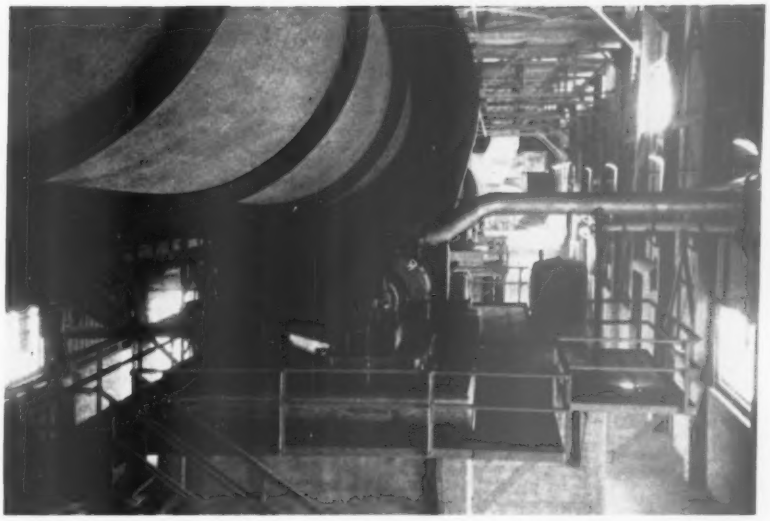
Narsted clinker coolers are now manufactured by the Fuller Co. and sold as the "Fuller-Narsted" cooler. Several recent installations have been made in U. S. cement mills.

Refractories

The company has experimented with various kiln refractories over the years including the use of insulation at the back ends and now has a more or less standard practice but, like other cement companies, continues to try newer developments in refractories. The use of back-end insulation has been abandoned for the newer kiln installations although newly developed refractory insulating block are slated for trial.

All kilns are lined for their entire lengths and the pattern is roughly the same in all kilns. A 12-in. lining of high duty brick extends a distance of about 10 ft. from the nose ring to the hot zone which is lined for a distance of 40 ft. with 6- or 9-in. Magnecon basic brick. This is followed by 40 ft. of 70 percent alumina, 9-in. brick, then 9-in. high duty brick to a point just above the ring gear. Six-inch high duty brick extend from this point to the start of the chain section which is lined with 4½- or 6-in. hard, dense wear-resisting brick. In the case of dry kilns 6-in. high duty brick extend to the feed end.

Stack dust picked up by scoop feeders below the chain section in wet process kilns is becoming standard practice in the company's plants



Use of forced air ventilation for kiln drive motors is standard in company's plants

Magnecon basic brick are cheaper and more readily available in Canada than high alumina refractories which must be imported from U.S.A. Experience with basic brick lining has been generally good with an average life of one year under forced firing conditions. The range in life is usually from eight months to as high as 1½ years, covering all kilns.

An interesting recent development has been an attempt to reduce loss of radiated heat from kiln shells by spray-coating the inside of the shell with high-temperature heat-reflecting aluminum paint and then applying the brick. This has been done throughout the drying and calcining zones of the 11-ft. 3-in. diameter kiln at Belleville and Exshaw and for 220 ft. from the feed end at Havelock. A 100 deg. F. differential has been observed at Belleville in measuring the outside temperature of the kiln shell near the feed end, with and without aluminum paint application. The outside shell temperature of the Havelock kiln, with exit gas temperature of 1200 deg. F., measures about 300 deg. F.

Kiln Drives

All of the kilns have their motor drives tied to the kiln feeder drives according to accepted practice to regulate the rate of feed, and they are driven at conservative speeds. The range in speeds for the wet process kilns is from 52-60 r.p.h. as a rule, the exception being at Belleville where the nodules are such that kilns may be run effectively at 65 r.p.h. or even faster. Raw materials at the various plants vary in their ability to produce sound nodules and their plastic properties generally do not favor high kiln speeds. Kiln drive motors at all plants are ventilated by individual forced air fans which practice has proved effective in increasing the rating of the motors by 15 to 20 horsepower. Motor drives are electrically interlocked so that they cannot be started unless the motor cooling fan first be placed in operation.

The dry process kiln at Havelock has a Ward-Leonard drive and, based on that successful experience, Ward-Leonard drives will be used wherever a motor-generator set may be required in any of the plants. Older kiln motor drives are all constant voltage, direct-current which requires that speed changes be accomplished in steps of 50-75 r.p.m., whereas the Ward-Leonard has an infinite, stepless speed range (with potentiometer-type rheostat) and is very sensitive to control with its variable voltage and separate excitation controls, if it be desired to vary the kiln feed rate in small increments.

At Fort Whyte, the new 12- x 450-ft. rotary kiln to be installed will have a 200-hp. motor of the steel mill type and Ward-Leonard control. The motor selected is of very rugged construction and designed for continuous operation in the steel industry. It has a foldover case on hinges so that the rotor can be lifted out for repair or quick replacement. Selection of this motor was made in order to minimize maintenance, which has proved to be the principal weakness of the ordinary d.c. kiln drive motor.

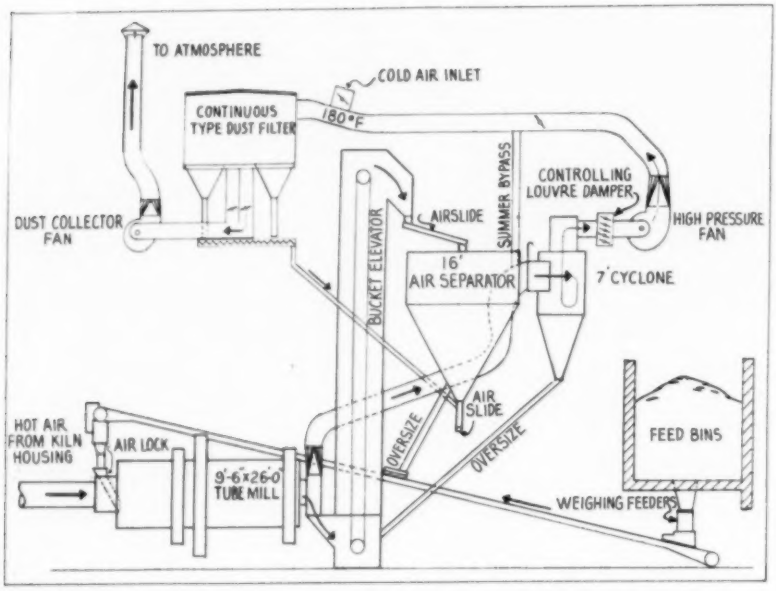
Incidentally, the first installation of a Ward-Leonard drive on an overhead crane in a cement mill is to be made at Fort Whyte. Selection of this drive was made in order to have the smoothness of direct-current operation and for higher speed and lower maintenance. It was desired to eliminate the flywheel or inertia effect characteristic of large a.c. motors and to have better control of the speed and point of stoppage. It is expected that much of the guess-work will be taken out of the crane operation and that the snapping of cables due to the many sudden motor contacts in a.c. operation will be eliminated with the smoother torque characteristics of Ward-Leonard control. Also, quicker raising and lowering of the bucket is anticipated.

Kiln Operations

All of the kilns are highly instrumentalized, but automatic operating features are held to a minimum. Instruments are considered as indispensable to control of operations and as a means of record-keeping and keeping the kiln burners on their toes. The theory of firing, generally, is to hold a constant kiln speed and to make compensating changes as required to meet changing load conditions by varying the firing rate.

Coal-fired kilns are fired by compartmented tube mills which each have a coal-drying chamber and two grinding compartments. Air for drying the coal is drawn from the kiln hoods, tempered as required, and swept through the mill from the feed end carrying the pulverized coal through the burner pipe into the kiln. Primary air usually is about 20 percent, with this type of mill. Secondary air is preheated to approximately 1200 deg. F. through the hot end of the Narsted clinker cooler. Airswept tube mills for direct firing have had a good maintenance record and have become standard in all plants of the company except at Hull where a B & W pulverizer is used.

The use of shell thermocouples at the discharge ends of the chain sec-



Flow diagram from one of the two raw grinding circuits, using exit gases from kiln for drying while grinding (Havelock)

tions and, occasionally, at other points was formerly considered important to control of firing for optimum efficiency and nodule formation but this practice has largely been discarded. The continuous oxygen recorder and draft recorders are now considered the key instruments for fuel efficiency, control of quality, the reduction of rings and for uniformity throughout the kilns.

The continuous oxygen analyzer is basically a coal control and is watched closely by the burner who quickly adjusts the rate of coal feed to the grinding mill in order to hold the instrument reading within the range of 1 to 1½ percent O_2. High readings reflect poor coal or lack of it which may be compensated for in about one minute. A low reading is often indication of a mud ring building up. Canada Cement Co. was one of the first companies to install continuous oxygen analyzers and has found them effective in saving fuel. In some of the plants one of these instruments, through Y connections, serves a pair of kilns, like at Montreal East where three L. & N. oxygen analyzers serve five kilns.

Adjustment to the draft louvres is made only if the coal-air ratio becomes upset considerably. Kiln speed changes are made only where unusual conditions of load are encountered.

Recording back-end draft readings are provided for all the newer kilns as a means to holding the draft as closely as possible to the desired figure. Damper adjustments are set manually through pushbutton on the burner floor to maintain the correct gas analysis, which will remain stable except for fuel changes or kiln obstructions. Kiln speed recorders are proving effective in checking on the slackness of burners.

All recording instrument readings are carefully analyzed daily and are used to good advantage in checking on and educating the burners and in stimulating competition between them. They have proven particularly valuable on the night shift.

Dust

Exit gases from the kilns exhaust through dust collectors of various types at the respective plants. Most collectors are of the mechanical type. At Montreal East, dust is collected in a 750,000 c.f.m. Cottrell electrical precipitator which is one of the largest in the cement industry. Many of the dust collectors are relatively new and the disposal, or return, of dust into the kilns has been the object of considerable and continuing research. Introduction of the dust into the slurry has been tried but without success, resulting in troublesome mud rings and irregular flow through the chain sections.

At Montreal East, all six kilns exhaust through the single, high efficiency collector and disposal of the dust has been a challenging problem. Raw materials are particularly unplastic at this mill with the result that some 300 t.p.d. of dust are collected. For several years the dust has been pug-milled into a 50 percent slurry and laundered into a disposal area near the quarry.

As this is written, facilities are being installed to return this dust into the kilns, using the Smidth scoop feeder for introducing the dry dust into the kilns below the chain section. It is presently being done on one kiln and on a few others in different plants. Apparently, it is the most effective method found yet for re-introducing dust without unbalancing the kiln and causing mud rings.

Use of the Smidth scoop feeder at the Brodhead, Penn., plant of National Portland Cement Co. was described in the June, 1954, issue of ROCK PRODUCTS, page 145. The dust return hood surrounds a narrow section of the kiln, is sealed to the kiln and is so installed that is can move with expansion or contraction of the kiln. Two small diametrically opposite rectangular holes are cut into the kiln shell, around which is fastened an inlet scoop and curved discharge scoop. As dust collects in the bottom of the hood, the scoop picks it up and discharges it into the kiln. The design is such that the dust is discharged without cascading, to avoid pickup by the gases.

The hoods are located approximately 20 ft. below the chain sections, in these installations, where the dust is mixed with dried nodules. Whereas at Belleville screw conveyors and a bucket elevator transfer dust directly from a Multiclone stack dust collector into the kiln, the system is quite different at Montreal East. Here, a fraction of the total dust from six kilns is being returned into a single kiln via F-H Airslide. Based on this experience, an overhead Airslide will be the means of supplying dust into each kiln, which will be a very substantial recovery.

The bustle around the kiln cannot have a completely airtight seal with the result that there is cold air drawn into the kiln which results in high oxygen analyzer readings. The solution will have to be a higher holding point for O_2 or the use of O_2 plus combustibles as the control figure.

Quarrying

Since World War II, the company converted all its quarry operations from rail haulage to heavy-duty trucks to reduce the cost of track-laying and maintenance, to cut overall costs and to provide more flexibility for selective quarrying. Haulage equipment consists largely of diesel-powered Euclids and there are also Easton semi-trailers hauled by International chasses. Average haul is 15-17 tons per load. At Exshaw which is in mountainous terrain, hydrotarders are used for braking on Euclid trucks.

Drilling equipment is largely of Bucyrus-Erie well drills and, recently, Joy heavyweight rotary drills have gone into service at Montreal East

(Continued on page 184)

View of Havelock plant from quarry side showing crusher building in foreground

Kiln Exit Gases Dry Raw Materials at Havelock, N.B. Plant

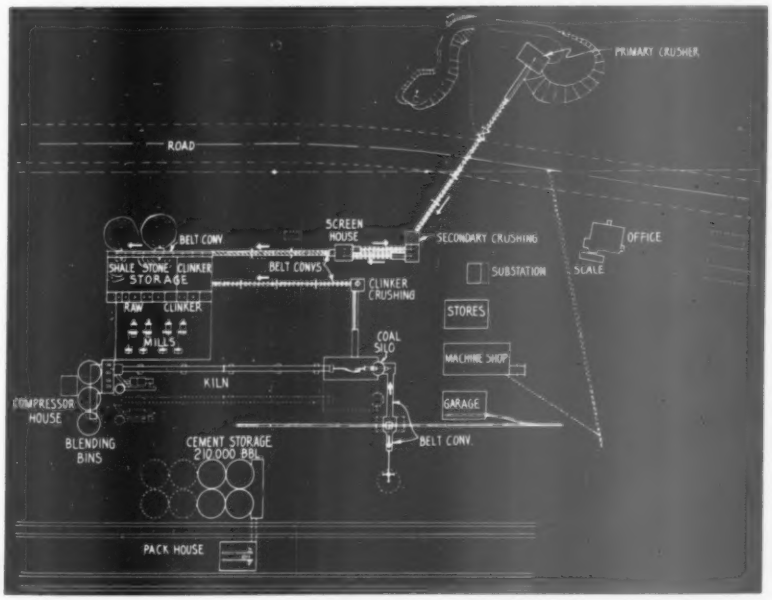
• Canada Cement Co.'s only dry process plant employs aeration for blending raw materials with results comparing favorably to the wet process of cement manufacture

CANADA CEMENT CO.'S new plant at Havelock, New Brunswick, is the first entirely new mill to be built by the company in many years and it is the only dry process operation. It was built to relieve the pressure on the Montreal East plant which had hitherto supplied the cement requirements of the Maritime provinces by rail and water, and in anticipation of future growth of the Maritimes. Cement is shipped from Havelock, largely by rail, into Nova Scotia, Prince Edward Island, Newfoundland and throughout New Brunswick. The Montreal East plant continues to ship cement by water to the Halifax distributing plant and is available to augment the shipments from Havelock by rail as well as into the Maritimes.

Havelock is 35 miles southwest of Moncton in a sparsely settled area. It was selected as the site for a plant because of the availability of suitable grade limestone, which is not a plentiful commodity in New Brunswick. The area was extensively explored and core drilled by geologists before the decision was made to acquire a 1500-acre tract of land for the plant. Other favorable considerations in the decision to build were the nearby availability of suitable shale and gypsum. Coal is shipped in from Nova Scotia.

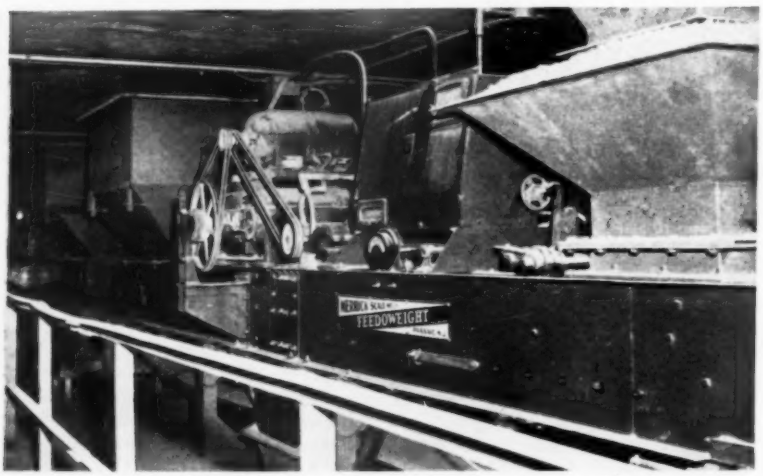
The decision to build a dry process plant, an entirely new venture for the company, was made because wells were the main source of water and the available supply was indefinite. Another disadvantage to the location was that part of the available electric power in the area is steam-generated and the cost of electrical energy is much higher than that at the other plants of the company. Plant design, therefore, put great stress on operating efficiency.

Major part of the construction was accomplished by company personnel and all construction came under the general supervision of H. W. Hamilton who is now superintendent of the plant. A construction camp had to be built, and housing, food and other necessary facilities were provided for a crew of 300 men during the construction period. The first concrete was poured in January, 1951, the kiln



Layout of dry process plant at Havelock, N. B.

Diesel-powered rear-dump trucks haul loads of 15 to 17 tons of limestone from the quarry to the primary jaw crusher which is fed by pan feeder below the dump hopper



Raw grinding is accomplished by two 9-ft. 6-in. by 26-ft. mills in closed circuit with mechanical air separators. Each mill is fed limestone and shale by proportioning feeders

Clinker is ground through two ball mills in closed circuit with mechanical air separators, the circuits carrying a 500 percent circulating load. Proportioning feeders regulate ratio of clinker and gypsum to feed belt conveyor above

came into production in December, 1951, and cement was being produced in January, 1952, just a year after construction started. The Canadian National Railroad renovated some of its line and installed new trackage from the village of Havelock to the plant. All shipments are by rail and about 10 percent are by bulk in hoppered cars.

Foundations for the plant structures were carried to solid rock because of the many underground springs in the area. The plant is a single-kiln operation with a 10- x 380-ft. rotary kiln and has a rated capacity of 2000 bbl. per day, or 800,000 bbl. annually, making it the smallest production unit of the company. However, it has been designed for future enlargement. Production is entirely of standard portland cement but limestone feed bin facilities were provided in the original layout for the anticipated manufacture of masonry cement. Also, provisions for the addition of sand and iron ore were made if that should become necessary.

The plant has a compact layout and features simplicity of design. Shale and limestone for mill feed, and clinker and gypsum are stored under roof, and materials are handled in storage and transferred to the mill feed bins by overhead electric crane. A single mill building housing both raw and finish mills parallels the long axis of the storage building. A row of mill feed bins within the storage area adjoins the mill building wall. The kiln is on the opposite side of the mill building with the storage silos and packing plant. The layout thus consists of a parallel design.

The limestone quarry is very close to the plant and the limestone from the screen house is carried into storage by belt conveyor. Air-quenched clinker from the kiln is put through a crusher and transferred into storage over a second belt conveyor.

Compactness was emphasized in design, but the plant nevertheless has several operating features of special interest. Among them are the use of waste heat from the kiln for drying the raw materials as they are ground, and the use of bin aeration for blending. Great stress was placed on the latter in an attempt to approach the wet process in accuracy of blending.

The plant has performed well in every respect and there has been little change in operations since production started except as to details. Performance has steadily improved as experience has been gained in the operation of the long dry process kiln. Downtime because of slag ring formation and refractory failures has been reduced from 15.4 percent in 1952 to 11 percent in 1953 and it is expected

will soon be reduced to the 7 or 8 percent which is the average for all the company's kilns.

Portland cement is being produced with a power requirement of 22 kw.h. per bbl. reflecting improvements in increasing the output of grinding mills through stepped up circulating loads. The fuel requirement averages approximately 910,000 B.t.u. per bbl. of clinker in producing well over rated capacity of the kiln. Use of waste heat for the drying of limestone and shale calculates to a saving of 2 cents per bbl. Raw mix composition is being held to within ten percent of the determined holding point which compares well with wet process blending.

Minor difficulties have been encountered, largely due to climatic conditions. The area is subject to extreme and sudden temperature changes which have presented severe condensation problems. Extremely cold temperatures have required that provisions be made available for the heating of lubricants and certain lubricating points. Strip heaters have proved the answer to some of these problems. Long deaerating screw conveyors had to be substituted for shorter ones in order to obtain a more uniform kiln feed. Certain firing changes had to be made, as experience was gained, in order to reduce downtime from kiln rings. To sum it up, performance has been satisfactory and operating difficulties have been very few.

Raw Materials

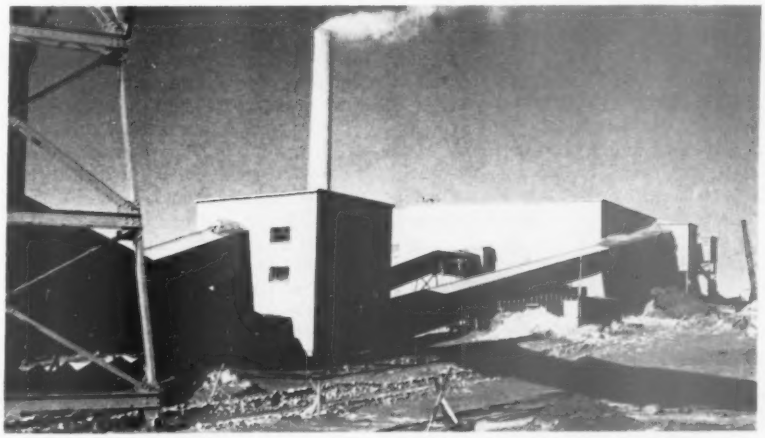
Limestone at Havelock is in a well-bedded deposit, small in area, that is deep in the middle and thins out toward the edges. It is much like a large dish in shape or might be described as a large lens, and it is underlaid by a siliceous conglomerate. The face height varies from 20 to 46 ft. across the slope of the quarry.

High magnesium limestone lenses occur through parts of the ledge of rock, which complicate quarrying operations. These lenses range from 3 or 4 percent MgO and up as high as 9 percent MgO. The extent of their occurrence was not fully determined by ordinary exploration and core drilling, so the area is currently being quartered to locate the high magnesia lenses. Quarrying necessarily is selective and loading must be done carefully clear across the quarry face in order to get a good average cross-section, since the shale analysis runs from 2 to 3 percent MgO and the limit for cement is 5 percent.

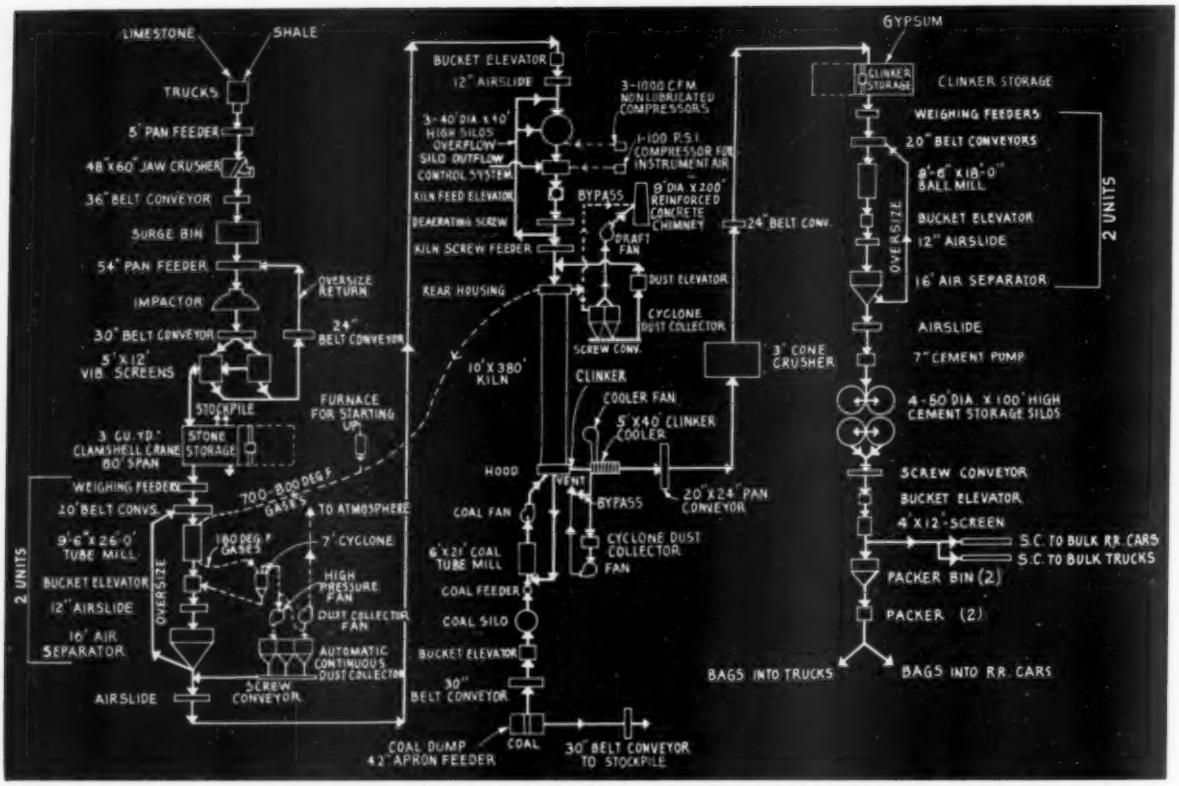
A typical chemical analysis of the limestone runs about 51 percent lime (CaO), 4.5 percent SiO_2, 1.6 percent combined oxides (R_2O_3), and 1.4 percent MgO. Limestone comprises about 80 percent of the raw mix.

View of Havelock plant showing, left to right, correction silos, feed tower, and 10- x 380-ft. rotary kiln. Dust collector is visible at base of stack; mill building and covered storage building are in background

Kiln is exhausted through this mechanical dust collector to the stack. All dust collected is returned into the kiln



Screen house and limestone conveyors. Long conveyor to storage for limestone



Flowsheet of single-kiln, dry process plant at Havelock, New Brunswick

Shale outcroppings occur through the area and the source excavated is six miles distant. A typical analysis is 60 percent SiO_2, 15 percent alumina, 6 percent Fe_2O_3, 4.5 percent CaO and 2.5 percent MgO. It represents about 20 percent of the mix.

Limestone, shale and gypsum are handled separately through the crushing plant. Shale is drilled with a gasoline-driven Bucyrus-Erie well drill and excavated by a 2½-cu. yd. Dominion diesel-powered shovel. The haul to the plant is contracted. A stockpile of quarry-run shale is built near the crushing plant for re-handling to the plant, when shale is being put through. This is done once or twice a week. Excavation and haulage of gypsum from a quarry 14 miles distant is entirely on contract.

Coal is shipped to the plant by rail and dumped into a rail hopper. A 42-in. Jeffrey apron feeder regulates the flow on to a 30-in. belt conveyor which transfers to a bucket elevator filling the coal mill feed silo. The silo is of reinforced concrete construction, has capacity for two days of operation, and has a suspended concrete cone below, from which a table feeder regulates the flow into the coal mill. The apron feeder at the rail hopper may be reversed and the coal be put into stockpile by a 30-in. belt conveyor.

Quarrying

Drilling in the limestone quarry is done by Model 26T Bucyrus-Erie electric well drills sinking 6⅝-in. blast holes. The holes have 15-ft. burden and spacing of 18 ft. and are fired in a single-row pattern, using millisecond delays, with initiation progressively. Nitron with M.S. connectors is used for detonation. A typical shot, of 15 holes, will bring down about 16,000 tons of stone.

Excavation is by an 85-B Bucyrus-Erie electric shovel with 3½-cu. yd. bucket, loading 15 to 17 tons of stone into either of two rear-dump Euclid diesel-powered trucks. The trucks dump into a hopper and the feed is regulated by a 60-in. Traylor cast-steel pan feeder into a 48- x 60-in. Traylor type H jaw crusher driven by a 250-hp. motor. The pan feeder has a constant-speed drive but a start-stop switch is used to regulate rate of feed and to maintain a bed of stone on the feeder to take the shock of falling pieces. The crusher is set to 5 in. on the closed side and delivers to a 36-in. belt conveyor. Design provided for this belt conveyor to deliver into a surge bin ahead of the secondary crusher and for a 54-in pan conveyor to feed the secondary crusher, but the surge bin is being by-passed for direct feed into the secondary.

Secondary reduction is through a size CF 13-44 Pennsylvania reversible Impactor driven at 900 r.p.m. by a 350-hp. wound-rotor motor. This unit is in closed circuit by way of a 30-in. belt conveyor with two 5- x 12-ft. Dillon vibrating screens which divide the stream. These are full-floating screens suspended on rods and reject plus ¾-in. material for return to the Impactor by belt conveyor. The minus ¾-in. product is taken by belt conveyor into the covered storage area or it may be stockpiled outside the storage area.

An installation of a hopper and feeder has recently been completed so that shale and gypsum may be fed to the return belt conveyor for direct feeding into the Impactor and thus by-pass the primary crusher.

Storage

Limestone and shale are stored in one half of the covered storage building, and clinker and gypsum in the other end. Capacity under cover is 5500 tons of limestone, 3300 tons of shale, 16,500 bbl. of clinker and 1000 tons of gypsum. A 3-cu. yd. Provincial Engineering Co. clamshell crane running on an 80-ft. span handles the respective materials in storage and fills the grinding mill feed bins. The crane is electric-powered and has an air-conditioned cab.

Feed bins are arranged in a row

alongside the mill building wall. A pair of limestone feed bins and one for shale serve two raw grinding circuits. Each is of 250 tons capacity. A pair of clinker bins (1600 bbl. each) and a 250-ton gypsum bin serve two finish mill circuits. Feed bins for sand and iron are not in use and a ninth feed bin has been provided alongside a clinker feed bin for future manufacture of masonry cement.

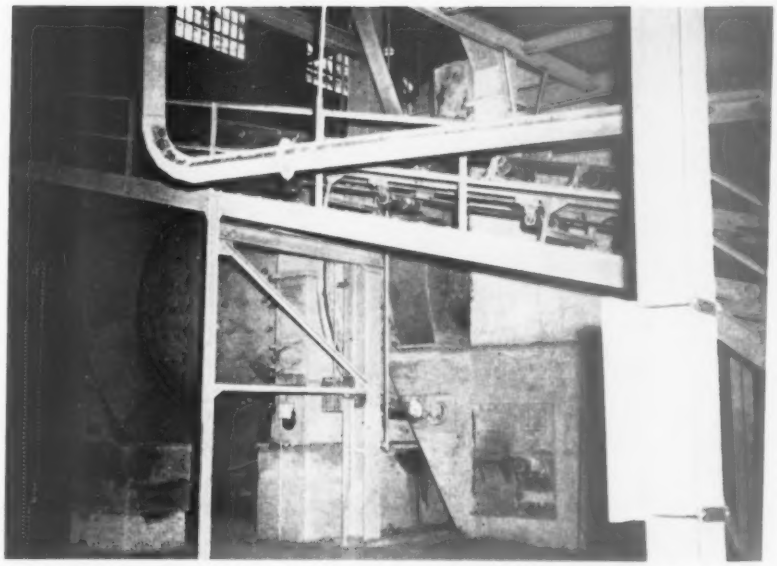
Raw Grinding

Raw grinding to 92 or 93 percent minus the 200-mesh sieve is accomplished through identical grinding units, each consisting of a 9-ft. 6-in. by 26-ft. F. L. Smidth Tirax mill in closed circuit with a 16-ft. Sturtevant mechanical air separator. Exit gases from the kiln are drawn through the mill from the feed end to dry the materials as ground. Each mill is fed shale and limestone by Merrick tandem Feedoweights. Normal proportions are 80 percent limestone and 20 percent shale. To change the proportions, a variable-speed transmission has been built into the drive of the unit feeding shale and may be adjusted by the chemist. Both Feedoweights in a grinding circuit are driven by 1-5-hp. vari-speed motors controlled by adjusting a remote speed control knob on the mill panelboard. Thus, both the chemist and the miller have their own separate controls. A horn sounds if one Feedoweight should stop and the second unit automatically stops.

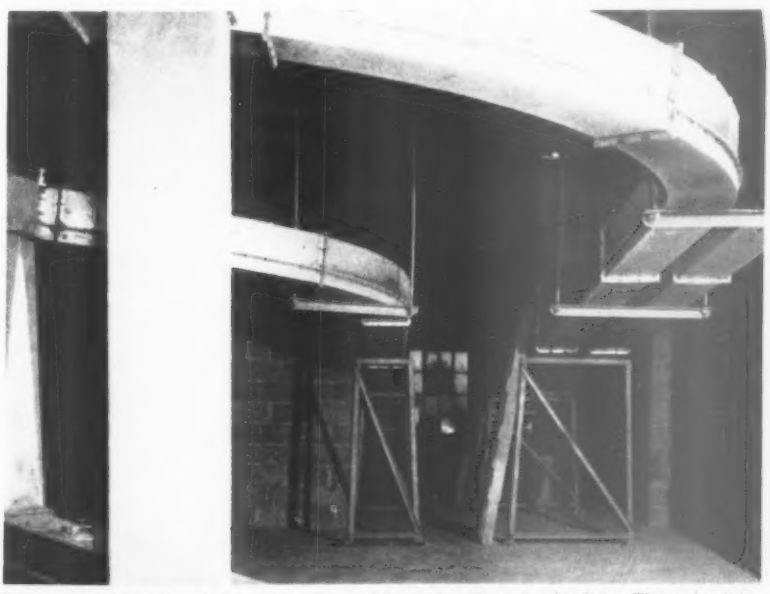
Proportioned materials are fed into each mill by a 20-in. inclined belt conveyor. The first 10 ft. of each mill is a drying compartment and the balance is the grinding chamber. The original charge of forged steel balls was 20,000 lb. of 2½-in. size, 20,000 lb. of 1½-in. and 27,000 lb. of 1-in. size. Each mill is driven by a 500-hp., 180-r.p.m. synchronous motor of the split-winding type. The mills are supported on two slide rings with totally-enclosed slide shoe bearings. An outside pressure lubricating system is required for starting purposes after which lubrication is sustained by the dip method. Ni-hard liners with lifters have been grouted into the drying compartments and the grinding chambers have bolted forged steel liners. Each mill discharges into a bucket elevator from which a 12-in. F-H Airslide delivers into the mechanical air separator. Rejects return to the 20-in. belt conveyor feeding the mill, and the air separator products are conveyed by F-H Airslide for elevation overhead and transfer into either of three blending and storage silos.

An airlock is provided at the feed end of each mill to prevent indraft. The gases passing through the mill pick up some dust so they are drawn through a 7-ft. cyclone by a high pressure fan which delivers to a Sly continuous-type dust filter. A dust collector fan overcomes the resistance of the filter, to exhaust through a stack. Dust trapped in the cyclone is spouted into the elevator from the mill to the air separator. Dust collected in the Sly filter is spouted to join the separator stream of finished material. All ducts, the elevator casing, dust collectors and the air separator are covered with a 2-in. thickness of Fiberglass insulation.

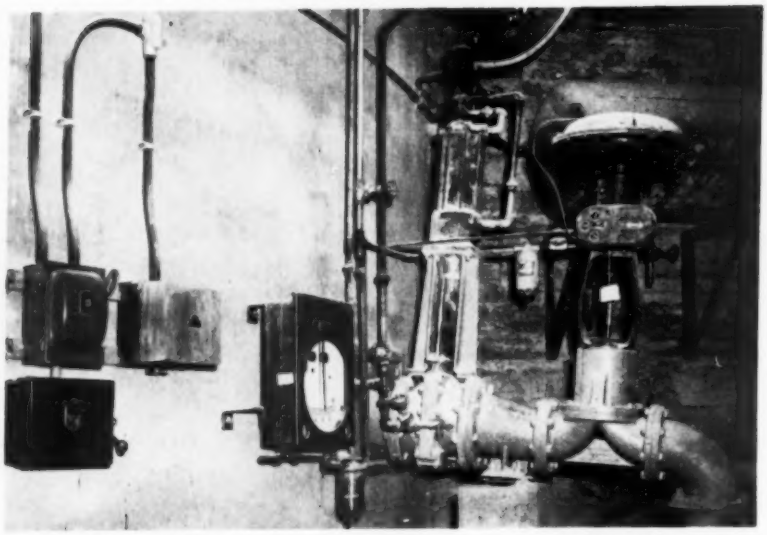
The kiln exhausts at a temperature of 1170-1250 deg. F. as measured at the outlet, the gases being drawn through a dust chamber and a Buell cyclone dust collector by a No. 600 F.L.S. draft fan rated at 135,000 c.f.m. 4.5 in. w.g. Normal draft carried in the kiln as measured at the feed end is 1.3 in. negative static pressure. The aforementioned back end kiln temperature range and draft are maintained for optimum kiln performance and are not changed to meet variations in requirements for drying. Oil-fired vertical furnaces were used at first in starting up after a kiln shutdown, to supply hot gases until the back end of the kiln was heated, after which the oil burners were stopped. That practice has been discontinued



One of two ball mills for raw grinding. Exit gases from the kiln are air-swept through the feed end of the mill to dry the raw materials



Raw material handling to blending silos and from the silos is by Airslides. These Airslides are above the blending silos



System of valves and controls to regulate outflow from blending silos

and the dampers are opened immediately so that kiln exit gases may be drawn through the mills.

Moisture content of the raw materials varies considerably between summer and winter. In the winter months the shale will average between 9 and 10 percent moisture and the limestone will average 3 percent. The figures drop to 8 percent for the shale and 1 percent for the limestone in the summer. Average for the year is 1.5 percent moisture in the limestone and 9 percent in the shale. Variations are compensated for by changes in the circulating load in the grinding circuit. The air requirement to dry the material to the desired figure of less than ½ percent moisture is roughly 5000 c.f.m. per mill for summer operation. The figure would be somewhat higher in the winter and might reach 13,000 c.f.m. for abnormally wet and cold conditions. On the average, 10,000 c.f.m. (including infiltration) would be sufficient with a gas temperature of 650 deg. F. entering the mill. The raw mill fans are rated at 28,000 c.f.m. at 10 in. static pressure.

The temperature drop of the gases from the kiln chamber to the mills may be 500 deg. F. or more depending on outside temperatures. The average figure entering the mills is 500-600 deg. F. Experience has been that drying is much more effective with both mills in operation, due to the tendency to pull in cold air when one unit is running. There are louvre dampers at the air intake of each mill for draft maintenance and practice is to shut the louvre damper if one mill is to be run. Manholes are provided in the main hot air duct for the removal of dust, some of which is spouted directly into the finished material airslide.

Operation of these grinding circuits is necessarily tied closely to kiln operation. Should the kiln ring up, its induced draft fan will pull a higher draft and there will be greater dust loss and the drawing of heat away from the mills. The mill fans, having much lower capacity, may then be unable to supply the necessary heat to the mills and the temperature of the gases entering the feed end of the mill may drop to as low as a third of normal. When the temperature drops too low, the mills must be stopped or the dust filter will plug. Rate of feed to the mills can be cut back until the condition is corrected as determined by the temperature into the dust filter.

Circulating loads in the grinding circuits vary considerably with outside temperatures since the drying temperature available determines how much material may be fed. Considerably higher circulating loads are carried in the summer months when the rate of feed is increased.

The critical temperature is the reading of the gases entering the dust filter, and the aim is to hold that temperature at 165-170 deg. F. A damper ahead of the filter opens automatically to let in cold air if the temperature reaches 180 deg. F. Temperature of the gases leaving the mills is measured as a check. The dew point of gases leaving the raw mill, when grinding high moisture shale and limestone, is about 130 deg. F. so it is desired that the air temperature not fall below that figure. Consideration has been given to installing strip heaters in the collector itself to keep the temperature safely over the dew point figure.

The drying-grinding circuits are highly instrumentalized, and there are several manual adjustments. The closing gate at the kiln dust chamber is under manual control. The main bleeder damper common for both mills is manually operated. The filter bleeder damper (one for each mill) is L & N Electromax control as is the flow-regulating damper for the hot gases entering the mills. Other dampers are hand-operated. There is a thermometer for the Electromax controlling the filter cold air inlet and a thermometer bulb for high temperature and low temperature readings at the filter inlet, which actuate an alarm. Temperatures of the mill inlet and outlet are also measured, and the mill outlet temperature is under Electromax control.

Pressures at each point in the system—before the mill, after the mill, before the cyclone, before and after the dust collector—are indicated on a 6-point Hays draft gauge. The mill has a centralized control panel with recording ammeters and kilowatt meters for all conveyors, mill motors, feeders, the air separators, oil pressure gauges for the mill bearings, pressures, etc. The entire operation is fully interlocked and there are tell-tale lights showing the location of trouble points.

Raw mill production averaged 87.4 bbl. per mill hour in 1952 and the figure was increased to an average of 101 bbl. per mill hour in 1953. The ball charge was increased to larger sizes (30 percent 3 in., 30 percent 2½ in. and 40 percent 1½ in.) and larger circulating loads were adopted, to achieve the increased capacity. Raw material is being ground to 93 percent minus the 200-mesh sieve with a total power requirement of 5.2 kw.h. per bbl. Ball consumption averaged 4.9 lb. per mill hour in 1953, which is at the rate of use of 1 lb. of balls per 19.26 bbl. of production.

The use of waste heat for drying while grinding has served to drive off moisture at the rate of 29 lb. of water per minute under average conditions which would require a heat input of some 29,000 B.t.u. per minute. The cost would be 2 cents per bbl. of production if supplemental oil heat were required for the purpose.

Blending

Ground raw material from the mechanical air separators is conveyed by Airslide for elevation overhead and transfer to a 12-in. Airslide filling either of three blending silos. The silos are equipped for blending through aeration and each is vented by a Sly dust filter. Each silo is 40 ft. in diameter by 40 ft. in height and has a capacity of 4000 bbl. clinker equivalent.

The blending system consists of the three silos, four enclosed steel bucket elevators designed to withstand high hydrostatic pressures and airslides for transfer into and from the elevators.

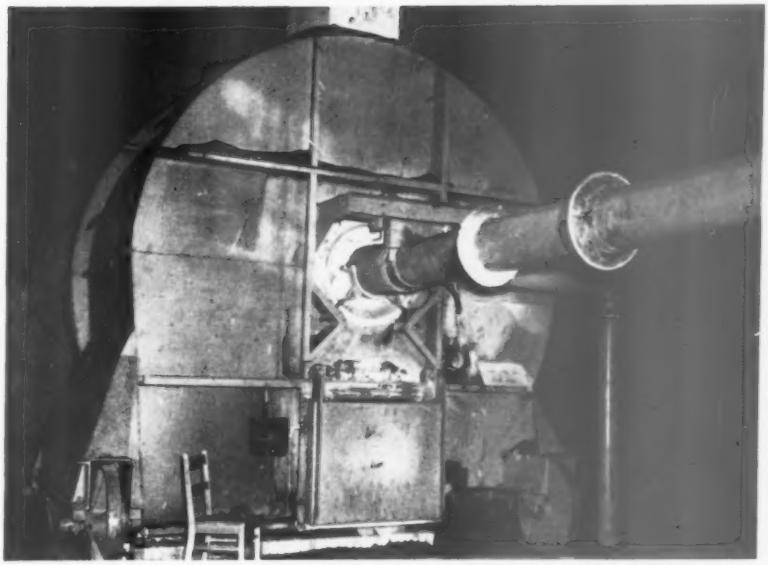
One bucket elevator serves to carry dust recovered from the exhaust gases of the kiln overhead for feed into kiln. A second bucket elevator supplies raw material into either of the silos via overhead airslide. The third is the kiln feed elevator. Either of two elevators is available for blending, in a flexible arrangement which permits drawing material from any silo by airslide and elevation overhead to discharge by airslide into either of the other silos. Normal practice is to blend by aeration as each of two silos is being filled and then transfer to the third silo (kiln feed) for additional blending. After analysis the material is withdrawn through an automatic feeding device into the kiln feed elevator. Kiln feed material is continuously sampled and the control is on the basis of C_3S. The blend is being held to within 10 percent on the basis of the CaO holding point.

The bottom of each slide carries a 4-deg. slope and is covered with Fuller porous aeration block which are piped together in groups in order that one-quarter the area of the bottom of a silo may be aerated at one time or all quadrants at the same time. The draw-off point from the silos is at the low side on the radial line between two of the aeration segments. It is so arranged that a small amount of air seeps into all segments of either silo bottom to establish an aerated condition before actual blending starts. Air is applied at 40 p.s.i. to a quadrant for 15 minutes and then to the others in sequence as regulated by time controller. There are three 1000 c.f.m. air compressors, driven by 125-hp. motors, to supply air at 40 p.s.i. for aeration and movement of material in the silos. In addition compressed air at 100 p.s.i. is available for instrument operation.

Low-pressure compressors are of Ingersoll-Rand manufacture and are of the non-lubricated type. The pistons are operated on carbon blocks as wearing surfaces so that no oil enters the compressing cylinders to plug up the porous block. Carbon blocks are rotated once a year. Compressed air is discharged to an air receiver and then to the pipelines connected to the separate segments in the silos.

There are three valves on the feeding device from a silo to the airslide transferring to a bucket elevator. One is an automatic air-operated cut-off valve which may be closed by push-button or will shut off the feed from a silo if there is a power failure or the material builds too high in the boot of the bucket elevator. In the latter case a Jeffrey Bin-Eye actuates the valve through interlocks and a solenoid.

The second valve arrangement is for the purpose of maintaining a controlled modulating rate of flow from out of a silo and is automatic. It consists of a Minneapolis-Honeywell diaphragm, Saunders Valve and Brown Instrument Co. controller. The system responds to a vertical bubble pipe in the boot of the bucket elevator. For continuous operating control, the Saunders valve is actuated by the diaphragm. Varying air pressure from the bubble pipe passes through the Brown controller which uses the impulse to control the high pressure (100 p.s.i.) air to the diaphragm. To prevent flooding in the boot of the elevator, the control constantly adjusts the position of the Saunders valve. The third valve is a manually-operated mechanical valve in the airslide from each silo. All operational controls and indicators are centralized on one panel.



Kiln has a retractable hood on wheels, and is direct-fired with coal through an air-cooled burner pipe

System for introducing compressed air into aeration segments in bottom of silos

Kiln feed material is elevated overhead to a long horizontal de-aerating screw which delivers to a choke-type screw feeder that discharges into the kiln feed pipe. The elevator carries an excess of material so that the choke screw will be uniformly full, and the overflow is returned to the silo in use. After the installation was completed it was found necessary to increase the length of the de-aerating screw conveyor from the original 40 ft. to 100 ft. in order to obtain uniform flow through.

The kiln feed screw is driven by a 7½-hp. motor electrically connected to the Ward-Leonard system of the kiln drive. The kiln feed versus kiln speed ratio may be changed by varying the feeder motor speed independently of the kiln motor through a rheostat, provided for this purpose. A Reeves variable speed transmission was originally installed for this purpose, but was found to be unnecessary, and has been removed.

There were some early difficulties with the stack dust return, due primarily to build-ups on the brick lining of the dust housing, and also to conveyor troubles. This problem has been largely overcome and all collected dust is returned to the kiln feed, using 12-in. screw conveyors to a bucket elevator, which discharges into the feed screw between the choke pipe section and the kiln feed pipe. Dust has been discarded upon occasion in order to determine its effects, adverse or otherwise, upon kiln operation, and actually no differences have been noted. A raw material factor of 590 lb. per barrel of clinker is ample for all requirements.

The stack dust collector has an effi-

This view in mill building shows one of the clinker ball mills in foreground and the two raw grind ball mills in background

ciency of approximately 80 percent and recovers 72 tons of dust per day which is returned to the kiln at the collection rate.

According to the chemist at the plant, the return of all the dust into the kiln is much more effective in the maintenance of chemical control and in the production of clinker of easier grinding characteristics than if only a small fraction be returned. It is planned to introduce the dust further up in the screw conveyor to the kiln feed spout in order to obtain better mixing.

Kiln

Clinker production of the 10- x 380-ft. Smidth rotary kiln is 2000 bbl. per day at best economy but it is producing 2500 bbl. with some sacrifice in fuel economy. It is supported on five full-floating tires, support rollers being of sleeve bearing design, and it has a slope of 7/16 in. to the lineal foot. The drive is a 125-hp. motor driven and controlled by the Ward-Leonard system, with a triple reduction to the master pinion. There is a tie through the same generator between the kiln motor and the motor driving the kiln screw feeder.

Lining of the kiln, starting at the discharge end, is as follows: 12-in. Super-duty brick—6 ft.; 9-in. 70 percent alumina—6 ft.; 9-in. Magnecon—15 ft.; 6-in. Magnecon—15 ft.; 9-in. 70 percent alumina—37 ft.; 9-in. 50 percent alumina—41 ft.; 9-in. Super-duty—82 ft.; 6-in. Super-duty—70 ft.; 6-in. High-duty—108 ft. Reflecting aluminum paint was sprayed on the interior of the kiln shell from the back end for one-half the length before the present lining was placed, as an experiment. Less spalling of the brick has been observed which may possibly be due to the aluminum paint, and skin temperatures as measured at the back end of the kiln are running lower than would ordinarily be anticipated. The figure is 300 deg. F. measured at 55 deg. F. outside temperature, with an exit temperature of about 1200 deg. F. for the kiln.

The kiln has a retractable hood on wheels, which is over the inlet from the primary section of a 5- x 40-ft. Narsted air-quenching clinker cooler on the floor below. It is direct-fired through an air-cooled burner pipe, from an air-swept 6- x 21-ft. Smidth Tirax mill. The mill is driven by a 125-hp. motor and carries 16,000 lb. of grinding media. It has a preliminary drying chamber. Heated air taken from the kiln hood is swept through the mill and the coal is fed from the overhead silo by a table feeder which has a variable-speed drive and is controllable from the burner's platform. Heated air entering the coal mill is held at an average temperature of 350 deg. F. and the primary air-coal mixture enters the kiln at 190 deg. F. Fineness of grind is 91 percent passing the 100-mesh sieve. Coal moisture averages 3.3 percent. It is a 13,500 B.t.u. coal with approximately 8.8 percent ash.

At the back end of the kiln, the steel dust chamber is lined with 9-in. firebrick. An insulated duct runs from this chamber to the raw mill but the bulk of the volume of gases is drawn through a No. 12A2 Buell dust collector with 12 cyclones by the No. 600 F. L. S. draft fan, exhausting to the atmosphere through a 9- x 200-ft. Custodis reinforced concrete stack that is brick-lined.

Firing

All instruments concerned with firing the kiln are centralized on an F. L. S. control panel. The key instruments in the control of firing are an L & N draft controller and continuous oxygen analyzer of the combustion furnace type. The filter is blown once per shift.

Downtime of the kiln has been substantially reduced as experience was gained by the men in the use of the instruments and in the interpretation of the readings. Time lost because of kiln rings was 240 hr. for 10½ months in 1952 and 99 hr. for the entire year of 1953. Downtime due to refractory failures was cut from 753 hr. to 687 hr. covering the same comparative periods. Total downtime was reduced by one-fourth.

Kiln speed has been established at 65 r.p.h. and is slowed only to meet flushing or speeded up to meet low-load conditions coming through the kiln. Back-end draft is held at 1.5 in w.g. by an Electromax controller. Back end temperatures are maintained for best fuel efficiency at a given production rate, regardless of the requirements for drying in the raw mills, and for the production of sound clinker.

One of the changes made in firing practice which apparently has contributed to reduced ring formation was increasing the diameter of the coal pipe nozzle and stepping up the percentage of primary air from 18 percent to 25 percent. The shorter flame resulting has conditioned the

Air quenched clinker is conveyed by pan conveyor (foreground) to cone crusher in building in foreground. Front conveyor on left conveys crushed clinker to storage. Conveyor beyond is limestone conveyor

Left: Instruments and controls for raw mills are on individual panels in this plant

Right: One of the panels with instruments and controls for finish mill operation

material better for entry into the hot zone. Several ports on the kiln shell are the means of checking on the condition of the material as it enters the hot zone and to determine the degree of calcination. There are three raw material sampling ports installed on this kiln, located 74 ft., 189 ft. and 270 ft., respectively, from the feed end of the kiln.

Finish Grinding

Clinker is cooled to approximately 200 deg. F. over the air-quenching cooler and preheated air through the primary section enters the kiln as secondary combustion air. Excess air is exhausted after passage through a Multiclone dust collector (Precipitation Co. of Canada).

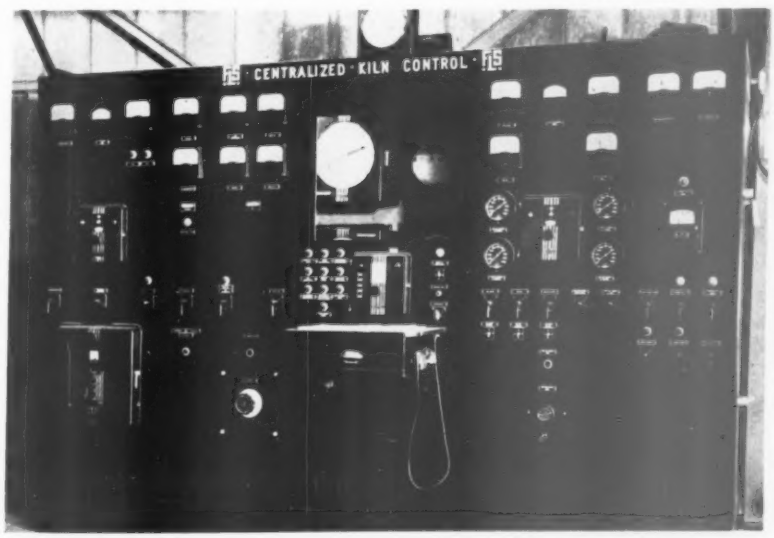
A 20- x 24-in. inclined pan conveyor puts the clinker through a 3-ft. Symons shorthead cone crusher, driven by a 60-hp. motor, to break up the large pieces (down to 3/8 in.). From this crusher, which is in a separate building, the clinker is put into storage over a 24-in. belt conveyor.

In an arrangement similar to that for raw grinding, a pair of Merrick Feedoweights is used to proportion the clinker and gypsum from feed bins on to a 20-in. inclined belt conveyor feeding each grinding mill. There are two 9-ft. 6-in. by 18-ft. Smidth Tirax ball mills, each in closed circuit by enclosed bucket elevator and F-H Air-slide with a 16-ft. Sturtevant mechanical air separator. The original charge was 86,000 lb. of forged steel balls from 1- to 2 1/2-in. size which has since been stepped up to 30 percent 3-in. balls, 30 percent of 2 1/2-in. size and 40 percent of 1 1/2-in. size. Each mill is driven by a 600-hp., 180 r.p.m. synchronous motor.

Standard portland cement is being ground to 2750-2850 Blaine surface at the rate of about 80 bbl. per hr. per mill. The circulating load averages approximately 500 percent and the rejects are returned to the mill in each case. Cement is being ground with a power requirement of 6.3 kw. h. per bbl. with a ball consumption of 16.79 lb. per mill hour or at a rate of 1 lb. per 4.4 bbl. of cement.

Cement is pumped by a 7-in. type H.S. Fuller-Kinyon pump through a 6-in. line into either of four cement silos. Total cement storage is 225,000

(Continued on page 184)



Centralized control panel for operation of 10- x 380-ft. rotary kiln

This view shows kiln No. 3 building at Belleville. Dome-roof slurry basin is to the left

TRIPLE CAPACITY of Belleville, Ont. Plant

• This Canada Cement Co. plant supplies, through water shipments, cement for retail plants in Toronto and Windsor

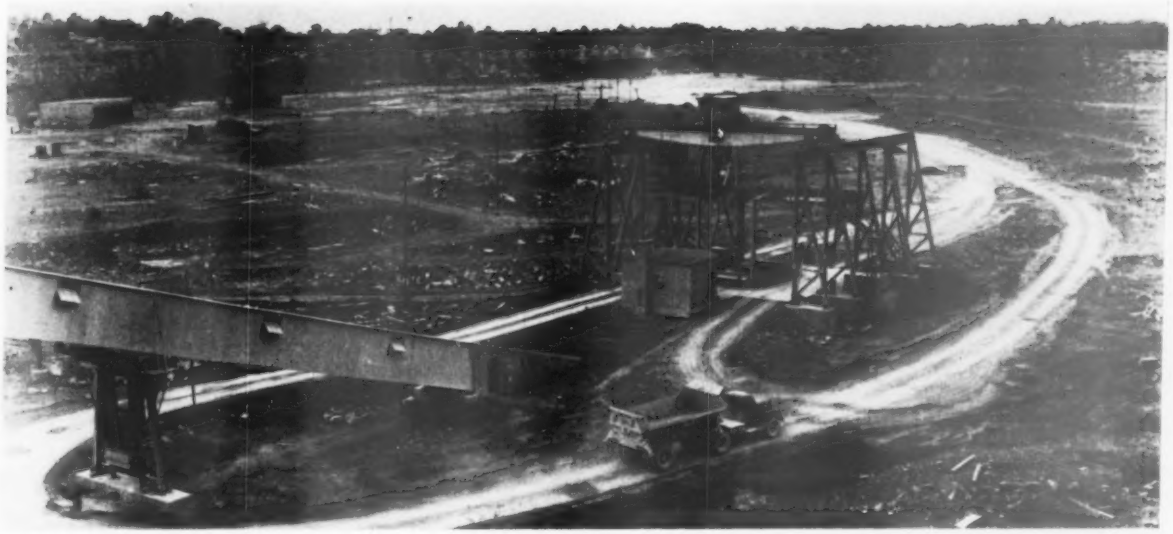
TWO EXTENSIVE ENLARGEMENT and modernization programs completed at the Belleville, Ontario, plant since the end of World War II have made Belleville the second largest production unit of Canada Cement Co. It was a single kiln operation when World War II started, with an 11-ft. 5-in. by 10-ft. 2-in. by 11-ft. 5-in. by 455-ft. (including Unax integral cooler) Smidth rotary kiln.

A 42-in. belt conveyor delivers cement to three loading chutes on the dock bridge, and the cement is weighed as loaded. Here, the E.M.V. Cemenkarrier is being loaded

Expansion was started as soon as equipment became available following conclusion of the war. Capacity was doubled in the 1948-1949 period with installation of a duplicate kiln, addition of new raw and finish grinding capacity, the building of new finished cement silos, a second wash mill and new blending tanks. This program raised productive capacity to 2,600,000 bbl. annually.

In the 1952-1953 period, an 11-ft. 3-in. x 430-ft. Smidth rotary kiln was installed, along with necessary enlargement in other departments, to increase capacity of the mill to 4,000,000 bbl., annually. This kiln is of straight cylinder design, whereas the earlier two are of the "dumb-bell" design with restricted diameter calcining zones.

Its installation required considerable enlargement to the stone storage facilities, two additional wash mills in a new modern building, a complete new raw mill with Unidan mills, and more clay and slurry storage basins.



Primary gyratory crusher is on quarry floor at Belleville, where roadways permit dumping into either side of crusher by semi-trailers. Note overhead crane for servicing crusher and for eliminating hang-ups in crusher

Bulk of the production is of standard portland cement. This is the first of the company's plants to produce masonry cement. Air-entraining portland cement is produced when required, for highway building purposes. Until recent years, large tonnages of railroad ballast were produced but that operation has been discontinued.

Location of the mill is at Point Anne, just outside Belleville, which is roughly 100 miles east of Toronto on the north shore of Lake Ontario. It is on the Bay of Quinte and approximately 30 percent of production is transported by the bulk cement vessel, E. M. V. Cemenkarrier, delivering to the Toronto and Windsor retail plants. Sixty percent of the output is shipped by rail and the remaining ten percent by truck.

As shown on the accompanying layout of the plant, space was limited and it was necessary that kiln No. 3 be located entirely separated from the other two. Also, the new raw mill had to be built far removed from the older one, which continues in service, and it will be also noted that the new clay and slurry storages as well as the new wash mills were built where space was available within the main body of the plant. Stone storage is in a separate structure from the clinker storage. All of the major production units in service before enlargement started in the 1948-1949 period continue to be operated along with the new installations.

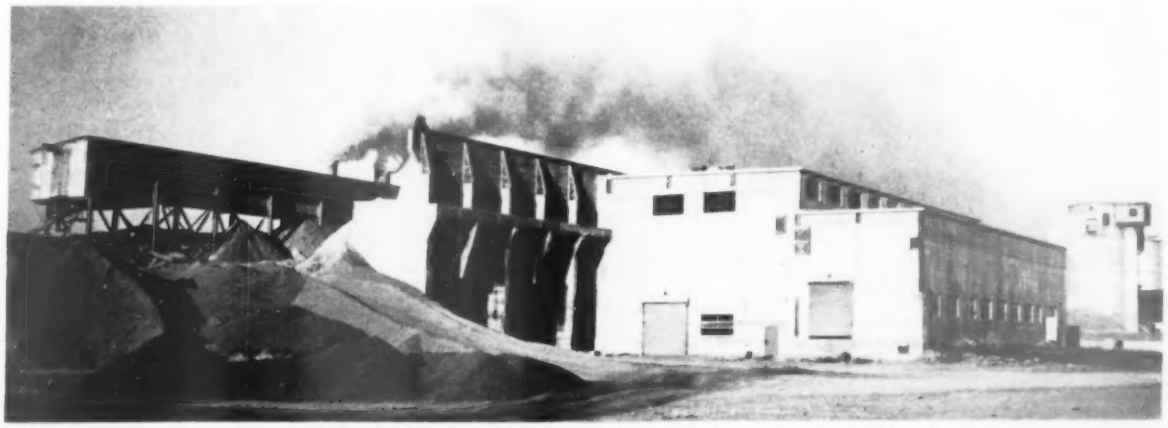
Raw Materials

Raw materials comprise high calcium limestone (90-95 percent $CaCO_3$) available from the quarry nearby the plant, and clay which is excavated some four miles distant and hauled to the plant in contracted trucks. Limestone comprises 75-80 percent of the mix and clay is the balance. The clay supplies the necessary silica and alumina. It contains varying amounts of siliceous hard pan which has bearing on the proportions used in the mix.

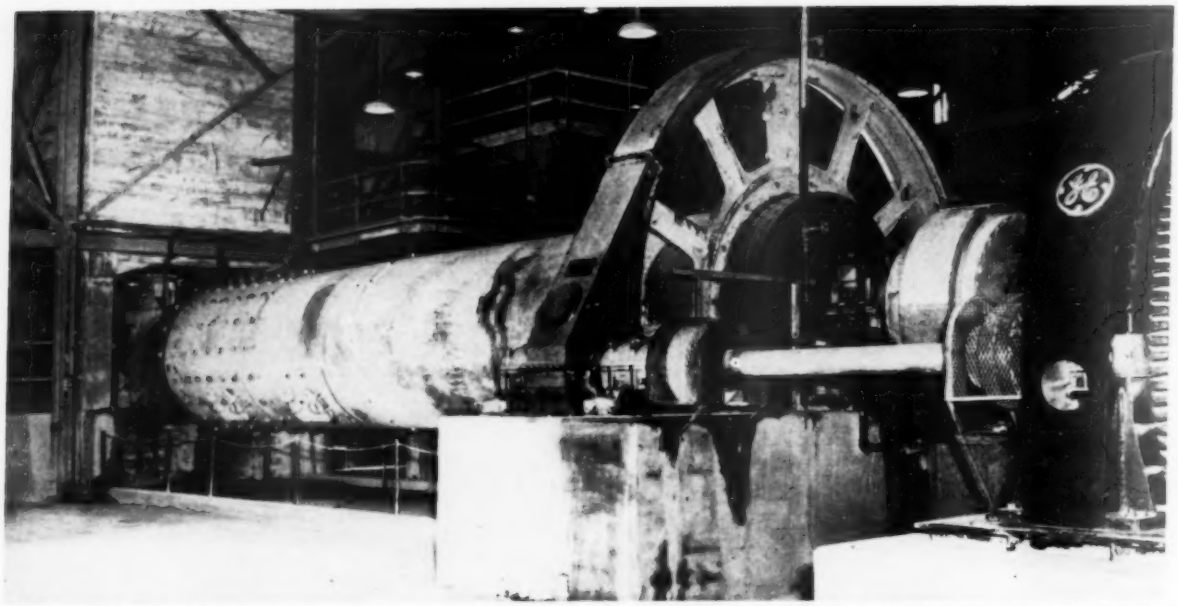
Clay occurs in thin beds underlaid by limestone, and a backhoe is used to excavate it and load into trucks. Topsoil is being replaced over the limestone to return the land to agricultural use. Clay trucks, being contracted for, are weighed on a 75-ft. Fairbanks-Morse platform plant enroute to the wash mills. This scale serves also to weigh bulk cement trucks.

The quarry is in a bedded limestone of high quality. There are no seams of clay or siliceous material but the bedding planes result in considerable blocks of stone resulting from blasting, requiring more than ordinary care at the primary crusher in the turning of stone to minimize hang-ups.

A face height of 55-62 ft. is being worked, using two Bucyrus-Erie crawler-mounted well drills to drill 9-in. blast holes. These drills were



Limestone storage area and adjoining new raw mill at Belleville plant. A bridge crane on a span of 100 ft. feeds limestone into mill feed bins along the near wall of storage area



One of three 8- x 39-ft., three-compartment raw mills in new raw mill department at Belleville plant. Mills are driven by 800-hp. electric motors and each produces 100 bbl. per hr. of slurry in open circuit grinding

purchased since World War II to replace smaller units, as part of the company-wide quarry modernization program. Spacing of blast holes was increased from 12-ft. burden by 18 ft. spacing to 20-ft. burden with 25-ft. spacing. Millisecond delays are used in blasting and, recently, the use of Nitron (du Pont Nitramon in the U. S.) with M. S. connectors was adopted for detonation. An average of ten holes, single row, is detonated per shot by the progressive pattern of shooting. Average yield is four tons of stone brought down per lb. of explosive.

Excavation is by two crawler-mounted Bucyrus-Erie electric shovels with 3¼-cu. yd. buckets which have replaced old 2¼-cu. yd. shovels. Up to the time all the quarries were converted over from rail to truck haulage, the primary crusher was located halfway up the quarry face at Belleville and railroad trackage circled around the quarry to the crusher in order to avoid the shovel cables. Six cu. yd. side-dump cars were then in use, hauled by 12- and 16-ton locomotives.

Haulage is now done by five International trucks with Easton semi-trailers hauling 17 tons to the trip from the shovel. The primary crusher is a 42-in. McCully gyratory located on the quarry floor. As may be seen in one of the illustrations, roadways permit stone to be dumped into either side of the crusher, and an overhead 30-ton Northern crane with operating cab is available for constant service of the crusher. The crane was installed to handle crusher spiders and other heavy parts but the operator is constantly manipulating stone blocks in the crusher cavity to prevent choking. Otherwise, more secondary crushing would be necessary in the quarry. An average of 25 large pieces of stone must be block-holed per day.

One of the two reversible impactors at Belleville plant which is fed limestone by apron feeder and operated in closed circuit with vibrating screens. Reduction is to ¾-in. top size for mill feed. Similar reduction crushers are operated in other mills of the company

Crushing

Secondary crushing capacity is far in excess of that for the primary so the McCully is set wide open to deliver stone up to 8-in. top size on a belt conveyor for delivery out of the quarry to a bin in the secondary crusher building. There are two Pennsylvania reversible impactors, each fed by a Stephens-Adamson inclined apron feeder and operated in closed circuit with a pair of Dillon single-deck vibrating screens which split the load. One unit was installed in 1949 and the second, in 1953, when No. 3 kiln went into production. Each pair of vibrating screens is in a separate structure. Belt conveyors are the means of feed over the screens and the return of oversize to the impactors. Reduction is to ¾-in. top-size which is transferred into storage by a series of overhead belt conveyors.

The impactors are driven at 900 r.p.m. and are giving unusual performance. They are handling a massive, blocky stone with considerable large pieces, but stone that is low in silica. Using standard manganese steel hammers, a set of hammers lasts a year or more in crushing 300,000 to 400,000 tons of stone before replacement. This experience is much better

than it was when producing large tonnages of railroad ballast. Then, a large number of holes was blasted which permitted the accumulation of ice and snow in the winter months. Smaller, more frequent shots are now the rule.

Stone Storage

Until installation of kiln No. 3, minus ¾-in. stone was stored in the area presently in use, but capacity and handling facilities had to be enlarged. The area had been laid out for later expansion and completion of the sidewalls for accommodation of a bridge crane. Stone was stored in a single pile. In the 1953 program, the area was extended and widened to 200 ft. in length and a span of 100 ft. It is open storage and is served by a 12½-ton Provincial crane with 3½-cu. yd. Blaw-Knox clamshell bucket. It is alongside the new raw mill building completed in 1953. Mill feed bins are in a row along the storage area. Belt conveyors are the means of transfer of stone from storage over the top of kilns 1 and 2 to the old raw mill.

Clay

There are now four clay wash mills in service. The first was installed beneath kiln No. 1 back in 1936 at the time the plant was converted to the wet process. A second was installed in 1949 when kiln No. 2 was started. Both of them are under the kilns to take advantage of the radiated heat.

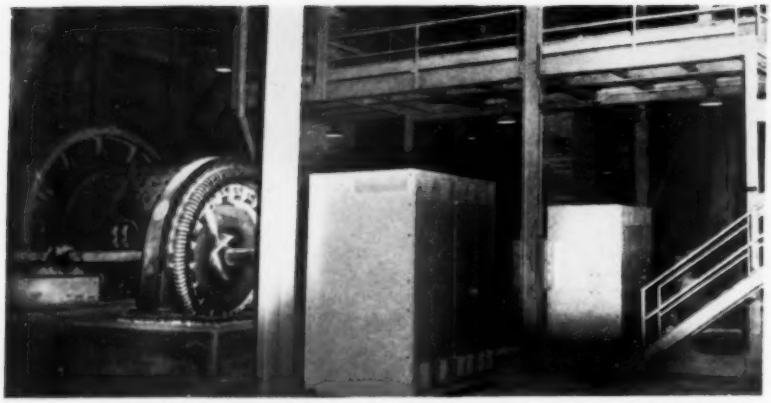
Two new 25-ft. Smidth wash mills were part of the 1953 enlargement program and they are in a separate structure as shown on the layout drawing. Actually, three wash mills would be sufficient for 3-kiln operation, but excess capacity was desired because there are times when considerable stone accompanies the clay, and in order to permit one to be taken out of service each day if necessary. The newer units revolve at 10 r.p.m. and are of self-cleaning design with holes cut in the bottom for the drawoff of stone through chutes on to belt conveyors for disposal. The clay slip carries 62-63 percent water.

Clay slip is pumped by Wilfley slurry pumps into either of two clay storage basins. One is the old rectangular storage basin alongside the older kilns, which has travelling air agitation. The

General arrangement of Belleville cement plant

Left: Clinker pan conveyor from kilns to storage at Belleville plant

Right: View of covered clinker storage area. Clinker at all plants is crushed to ⅜-in. top size through cone crushers before being placed into storage



One of the ball mills for preliminary grinding (open circuit) in finish mill

second is a new storage basin, of rather interesting design, that is a duplicate of a new slurry storage basin built at the same time.

It is a circular structure of reinforced concrete construction and has a concrete dome roof, heavily reinforced and placed by the gunite process in lifts. The basins are 80 ft. in diameter and 20 ft. in depth, holding 100,000 c.f. of material. Each has a rotating travelling agitator with compressed air supplied from rotary compressors mounted on the agitator arm. The agitator is supported on a 6-ft. diameter center pedestal and the outer rail is on the circular wall.

Speed of the rotating agitator is a revolution in 2½ minutes, and an electric air-distributor time cycle controller regulates the periodic blowing of air through the various downpipes at set intervals. Air for the purpose is compressed to 25 p.s.i. by a 400 c.f.m. Fuller C-80 rotary compressor.

Clay slip from both storage basins is pumped into a silo adjacent to the new raw mill from which transfer is into a bucket feeder distribution box to proportion the material to individual pumps below for transfer to the separate raw mills.

Raw Grinding

The new raw mill building is an impressive reinforced concrete structure paralleling the long axis of the stone storage and has a 10-ton electric service crane overhead on a 47-ft. span. It has provision for seven overhead feed bins on 28-ft. centers. Three are in use for three new mills, a fourth is not presently in use and there is room for three additional bins to serve future mill installations. Raw grinding is in open circuit through three 8- x 39-ft., 3-compartment Unidan mills driven by 800-hp. G. E. synchronous motors. The mills are of the conventional trunnion type and produce 100 bbl. per hr. each at a fineness of 91-92 percent passing the 200-mesh sieve. They carry a charge of 35,000 lb. of 2½-3½-in. forged steel grinding balls in the first compartment, 27,000 lb. of ¼-2-in. size in the second compartment and 66,000 lb. of 1-in. balls in the finishing compartment.

Stone is fed into the mills by Smidth table feeders and clay slip is pumped into the feed end of each mill from the clay feed distribution box. Water is added for a slurry consistency of 35 percent H_2O. Discharge from the mills is put into a sump by screw conveyors and then pumped to the old raw mill building to join the output from the old raw mills in a sump from which transfer is by slurry pump to the blending silos.

Capacity of the old raw mill department is 375 bbl. per hr., where grinding is being accomplished in two stages. There are two 4- x 10-ft. Hardinge preliminary ball mills, each closed circuited with a wet-type vibrating screen carrying 15-mesh cloth, and producing 150 bbl. per hr. of feed material for tube mill feed. Throughs from the screens are carried in a common launder and the flow is divided into four 7- x 26-ft. Vickers tube mills where grinding is completed in open circuit at the rate of 75 bbl. per hr. per mill. In addition, there is a 7- x 39-ft. Unidan compartment mill producing 75 bbl. per hr. Finished product from the mills is carried to the sump which also receives the output form the new raw mill.

Three of the Vickers mills have been in service since 1936. The fourth unit, the second Hardinge mill and the Unidan mill were added in 1949 when kiln No. 2 was started. The new raw mill was to meet the increased requirements when kiln No. 3 was added.

Blending is done in six air-agitated tanks of 3600 bbl. capacity each. These tanks were built in 1949 to take the place of three older ones. The old mixing basin in connection with the old storage is now used for supplemental clay storage.

After correction and blending, the slurry is pumped either into the old 10,000 bbl. capacity rectangular basin or into the new circular basin with dome roof which has a capacity of 12,000 bbl. This is a flexible arrangement whereby slurry can be pumped into either storage basin, from one into the other, or may be drawn from either basin to feed either kiln. Normally, slurry is pumped from the dome-roof basin to the feeder for the new kiln.

Interior of dome-roofed circular slurry basin showing rotating travelling agitator

Kilns

Kilns Nos. 1 and 2 are identical, with restricted diameter calcining zones and have integral Smidth clinker coolers. They are direct-fired from air-swept Smidth Tirax mills. These mills have a drying compartment, and heated air is drawn from the kiln hood, for drying the coal, to air-sweep the mill and inject the pulverized coal into the kiln through an air-cooled burner pipe.

Kiln number 3 measures 11-ft. 3-in. by 430-ft., is direct-fired with pulverized coal by a 6-ft. 6-in. x 23-ft. air-swept Smidth Tirax mill and discharges clinker over a 6-ft. x 49-ft.

4-in. Narsted air-quenching clinker cooler. Preheated air through the primary section of the clinker cooler enters the hood of the kiln as secondary air for combustion. Excess air through the secondary section exhausts through a Multiclone dust collector to the atmosphere. The cooler is fitted with a 4-blade hammer chunk breaker turning on a single shaft.

Lining of the kiln from the firing end is as follows: 9 ft. of 12-in. Super-duty refractory; 9 ft. of 9-in. 70 percent alumina; 42 ft. of 9-in. Magnecon; 40 ft. of 9-in. 70 percent alumina; 108 ft. of 9-in. Super-duty refractory; 114 ft. of 6-in. high-duty; 108 ft. of a hard, dense, wear-resisting brick throughout the chain section of the kiln to the feed end.

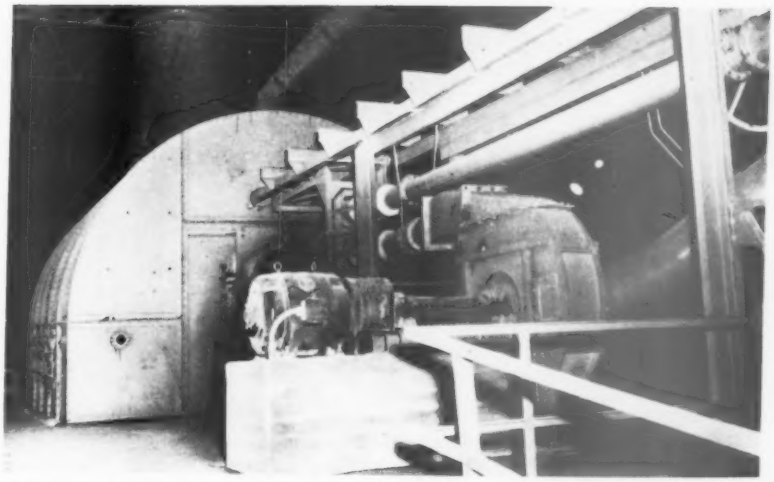
The kiln is turned at 63 r.p.h. and is driven by a 100-150-hp., 550-volt d.c. motor with a speed range of 300-900 r.p.m., through a Dominion speed reducer and Falk couplings. Kiln speed is synchronized with the kiln feeder speed in the conventional way, using a common generator. A Continental gasoline power unit is provided for emergency turning of the kiln. The kiln-drive motor is cooled by forced air from a ventilating fan driven by a ¾-hp. motor.

Exit gases from the kiln are exhausted through a 9VG Multiclone dust collector (Precipitation Co. of Canada, Ltd.) by a No. 660 FLS induced draft fan, driven at 720 r.p.m. by a 350-hp. motor through Texrope drive.

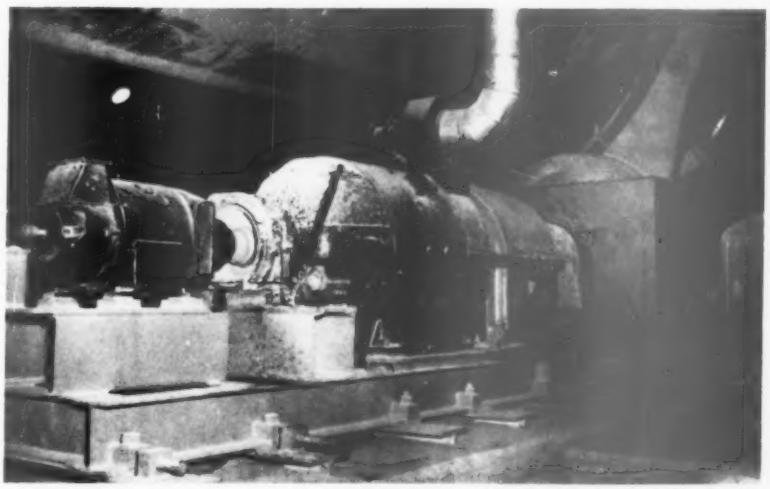
Firing is done with a ¾-in. 13,500 B.t.u. slack coal containing 8 percent ash. It is fed into the mill from an overhead feed bin by a table feeder with variable speed drive controlled from the burner floor. Heated air from the hot end of the cooler for No. 3 kiln enters the coal mill at 500-600 deg. F. and temperature of the coal-air mixture is maintained at 200 deg. F. The first 9-ft. 6 in. of the mill is the drying chamber. Fineness of grind is 92 percent passing the 100-mesh sieve. Coal requirement averages 76 lb. (No. 3 kiln) per bbl. of clinker.

All control instruments are on a centralized F.L.S. panel and include the conventional indicating and recording instruments, meters and starting switches. Among the principal instruments are a kiln speed recorder, continuous oxygen recorder and recorders for the secondary air temperature, rear-end temperature, draft and temperature in the duct to the stack dust collector.

Back end temperatures are held to 570-600 deg. F. and the speed of the kiln is adjusted to hold that temperature. The oxygen analyzer has been effective in closely controlling changes made to the firing rate.

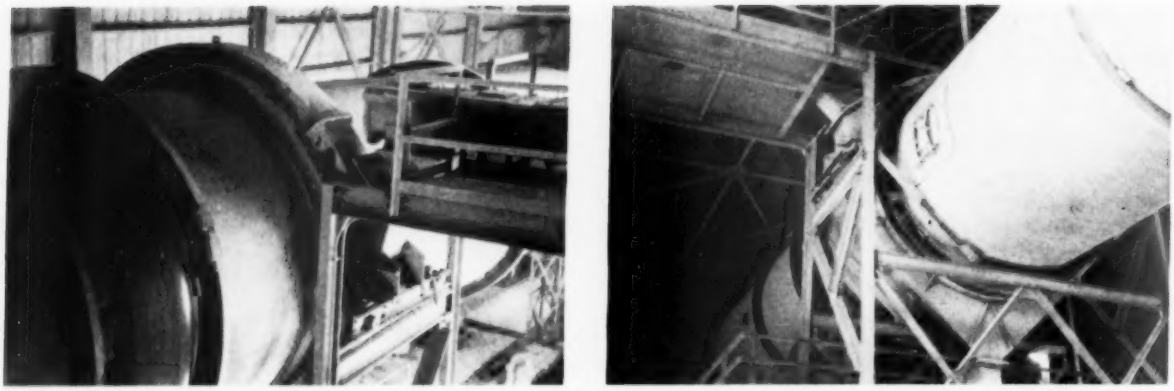


Firing end of kiln No. 2 with restricted diameter calcining zone and integral clinker cooler



One of the kiln drives at Belleville plant. Kiln drive motors at all plants are cooled by forced air from a ventilating fan, like this one. Gasoline power unit for emergency service is visible on right

Looking down side of 430-ft. kiln showing forced air cooling pipe for kiln motor



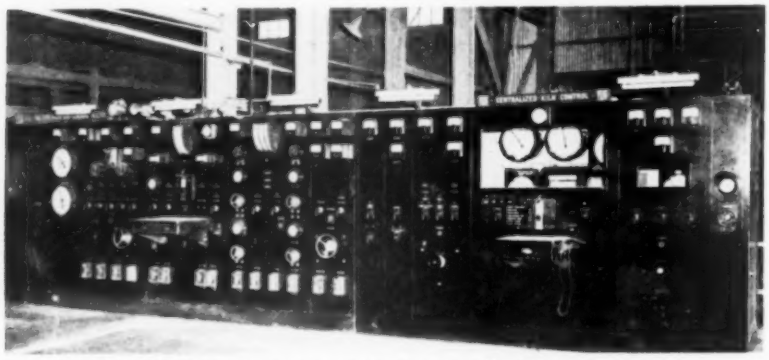
Stack dust is elevated into tightly-enclosed screw conveyor which discharges into housing surrounding the kiln at the scoop feeder

One of the interesting features of this plant is that each kiln has its individual stack dust collector and all of the dust is being returned into the kiln as produced. Smidth scoop feeders are being used to introduce the dust at a point some 20 ft. below the chain section, and with excellent results.

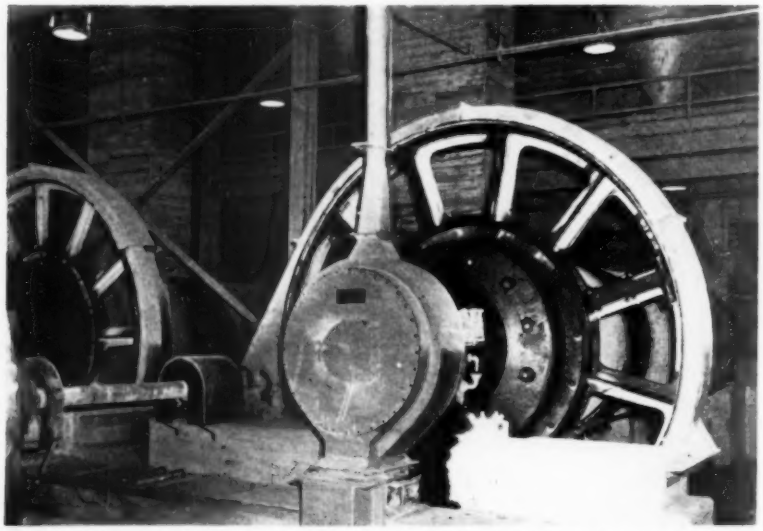
In the case of the new kiln, the dust from the Multiclone collector is transferred by two parallel screw conveyors into a dust-tight elevator. The screws are reversible so that the dust could be discharged outside to waste if necessary.

From the elevator, the dust may be discharged into a bin for later withdrawal to the same elevator, but normal practice is to elevate the dust into a tightly-enclosed horizontal screw conveyor, which discharges into the housing surrounding the kiln at the scoop feeders. The housing has very good air seals to minimize air leakage and is mounted on wheels so that it will conform with the longitudinal expansion or contraction of the kiln. If the kiln should be stopped, electrical interlocks will stop the dust collector and all conveying equipment. About 30 lb. of dust per bbl. is being returned into kiln No. 3, reducing the raw material requirement from 610 lb. to 580 lb. per barrel of clinker.

The main operating difficulty is that there is some cold air drawn into the kiln at the dust return feeder. It has little bearing on operations but does upset the O_2 readings as recorded. Due to such fluctuations it is necessary to check the CO in the gases with Orsats rather than depend on O_2 readings as the control for combustion.



Centralized kiln control panels for the two older kilns at Belleville



Finish grinding at Belleville plant is two-stage, with three ball mills in open circuit followed by four single-compartment mills (one shown here) each in closed circuit with a mechanical separator

Clinker Grinding

Clinker from kiln No. 3 is cooled to approximately 200 deg. F. over the Narsted clinker cooler. Clinker from all kilns is put through two 4-ft. Symons short-head cone crushers by pan conveyors and crushed to ⅜-in. top size; then conveyed into covered storage. The covered storage area is served by a 10-ton overhead crane and there is a feed bin arrangement for the finish mill similar to that for the raw mill.

Prior to 1948, clinker was ground through Kominuters followed by tube mills. Then in 1948, two ball mills and four Unidan compartment mills were installed, followed by a third ball mill in 1952. Thus the present arrangement is two-stage grinding with three 9-ft. 6-in. by 13-ft. 2½-in. Smidth ball mills in open circuit, followed by four 7-ft. by 30-ft. Smidth Unidan mills each in closed circuit with a mechanical air separator. The Unidans were converted from compartment type to single compartment at a later date and the circuit carries a 200 percent circulating load. Clinker is fed into the ball mills by Hardinge con-

stant weight feeders. Gypsum is proportioned from a central bin by means of a three-speed feeder, which discharges to a belt conveyor depositing gypsum into the ball mills. Cement is conveyed to storage through three F-K transport lines, these lines being 6 in., 7 in., and 8 in. diameter, respectively.

Sly dust collectors vent the Unidan mills, conveyors and elevators and a Norblo dust collector has recently been installed to vent the ball mills.

Masonry Cement

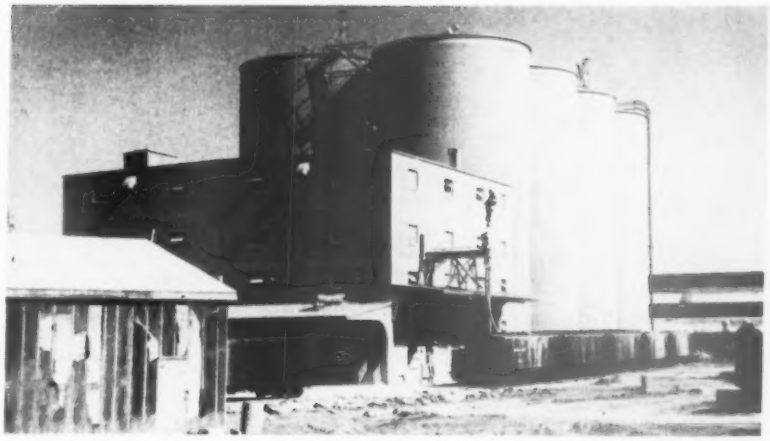
Masonry cement is produced through the regular finish mill, which necessitates cleaning out the system before the changeover. Clinker is fed to one ball mill and limestone to a second ball mill. The discharging streams are blended together in a common screw conveyor which transfers to a bucket elevator and a second screw conveyor from which the Unidan mill feed bins are fed. A 15 percent Vinsol resin solution is added by a Clarkson reagent feeder into the Unidan mills. One cement pump is used to transfer the finished product into storage.

Packing

Belleville has one of the most modern cement storage and packing plants in Canada. It was completed in 1947 and has eight reinforced concrete silos 50 ft. in diameter and 110 ft. high, and a reinforced concrete 4-story bag storage and packing plant. All of the structure is of concrete.

Cement is conveyed into the silos by three pumps, there being one 6-in. and two 7-in. F-K type H pumps. The floor of each silo is horizontal and has 24 draw-off chutes. Cement is withdrawn by three lines of 18-in. screw conveyors under each of the two rows of silos. These conveyors are reversible so that cement may be conveyed for packing in one direction or for boat loading in the opposite direction. Two older-type stockhouses are available but are presently not in use.

Packing is done by four Bates 4-tube 111 F.C. packing machines each of which has a transfer belt and reversible shuttle conveyor. The shuttle conveyors may be extended outside to load semi-trailer trucks or be withdrawn inside to feed cross-belts for railroad car-loading at each side. There are also facilities for bulk truck-loading. Cement in both bulk and bags is trucked as far west as Toronto and Hamilton by large trailer trucks.



Belleville has one of the most modern cement storage and packing plants in Canada, with special emphasis on modern facilities for bulk truck-loading

Elevating and conveying is so arranged that two types of cement may be handled simultaneously or so the cement from any silo may be directed to any one machine. Three elevators carry cement from the cross screw conveyors connecting the conveyors under the silos and elevate it to three Dillon vibrating screens. Then, a series of screw conveyors directs the cement to the several packing machines and bulk-loading points.

The three top floors are for bag storage and an enclosed lift is used to elevate the bags and to transfer them to the bag chutes feeding the machines. Two Sly dust collectors vent the building.

For boat-loading, a 30-in. belt conveyor carries cement from the screw conveyors beneath the silos to a second inclined 30-in. belt conveyor filling a 16,000 bbl. boat-loading silo. Gathering 18-in. screw conveyors below transfer the cement to a 42-in. belt conveyor (525 t.p.h.) delivering to three loading chutes on the dock bridge. Cement over the 42-in. belt conveyor is weighed by a Merrick Weightometer.

The office and laboratory are in separate structures at this plant, both being located conveniently for mill operations. The new shipping office with the scale having a deck length of 72 ft. is located with regard to location of the truck road and convenience to the packing department.

View from quarry floor showing system, above, for storage of limestone

Cement Plant Expansion

ARIZONA PORTLAND CEMENT CO., Los Angeles, Calif., announces that its long-range expansion plan for its Rillito, Ariz., plant is now underway. The order for the new kiln has already been placed, with delivery expected by October 1. The major expansion move is to be completed by October 1, 1955, when plant capacity will be increased from the present 4000 bbl. per day to approximately 7000 bbl. daily. Geologists have estimated that limestone and shale deposits near Rillito are sufficient to provide raw material for the cement plant for 50 to 100 years.

Acquires Canadian Firm

AMERICAN-MARIETTA CO., Chicago, Ill., recently announced acquisition of the B. C. Concrete Co., Ltd., Vancouver, B. C. The newly acquired subsidiary produces concrete drainage pipe and other precast concrete products for highway and general construction purposes. American-Marietta operates 32 concrete products plants in the United States.

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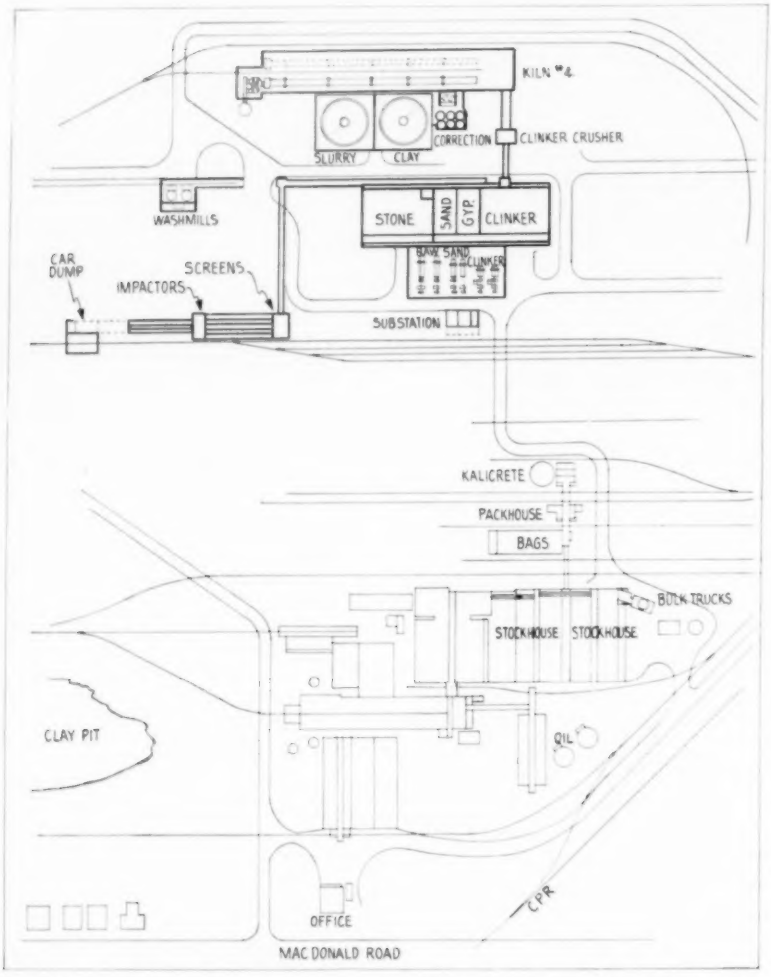
MURRAY-WILLIAMS COLOR & CHEMICAL CO., Maplewood, N. J., is producing colored concrete, ready-mixed except for the addition of water. Packaged in 25-, 50-, and 100-lb. bags, the concrete is available in green, yellow, black, blue, red, brown, grey or white, and is designed specifically for use by the home-owner.



Layout for new plant under construction at Fort Whyte, Manitoba. Existing plant is below and new plant layout is shown above

New Mill Now Under Construction to Have Oil-fired Kiln

• Fort Whyte, Man. plant will represent accumulated experience in design and operation. Oil-fired kiln will be 12- x 450-ft.

A COMPLETELY NEW WET PROCESS PLANT, with the exception of primary crusher and stockhouses, is now under construction at Fort Whyte, Manitoba, which is six miles from Winnipeg. It is being built around a 12- x 450-ft. Smidth rotary kiln and will have a rated capacity of 4400 bbl. per day, with provisions for doubling production later.

The company has been producing cement by the wet process at the Fort Whyte plant since 1928 and will continue to operate the old 4500-bbl. plant until the new mill starts production in 1955 and likely longer if demand for cement requires. The old plant has two 10- x 278-ft. kilns, and it has wet kominuters and tube mills for raw grinding with dry kominuters and tube mills for finish grinding. It is obsolete by comparison with other plants of the company in many respects and the only solution to bringing it up to efficiency was to build a new plant.

With completion of this plant, Canada Cement Co. will have gained its goal of 19.5 million bbl. annual capacity in 1955. Fort Whyte is the first entirely new wet process mill of the company to be built from the ground up in many years and will be representative of the accumulative experience gained in its other wet plants. Its layout and design and the selection of equipment and methods sum up the ideas of company operating executives and engineers as to their concepts of the "ideal" wet process portland cement plant.

The accompanying layout shows the relationship of the new plant to the old one, and points up the compactness and simplicity of the new plant. It could be termed a parallel design of almost equal dimensions in both directions, with a centralized open, covered storage area adjoining a single heated mill building for both raw and finish grinding and with the kiln on the opposite side, with slurry and clay tanks and storage basins conveniently located.

Raw Materials

Limestone for this plant is obtained from a quarry at Steep Rock, Manitoba, requiring a 158-mile rail haul to the plant, and clay is available locally. Iron cinders from Ontario and local sand are used to correct the mix.

Limestone is put through the primary crusher at Steep Rock and is then shipped to Fort Whyte for further crushing. A saving in power cost is thus realized since the company generates its own electric power at the quarry. It is preferred to do the secondary crushing at Fort Whyte in order to minimize freeze-ups in the railroad cars.

A Wellman car dumper is to be used for discharging all materials received by rail. A belt conveyor will be run from the car-dumping hopper to supply materials to the old plant. Secondary reduction is to be accomplished through a Pennsylvania CF15-50 Pennsylvania Impactor driven at 900 r.p.m., in closed circuit with two 6- x 14-ft. Dillon vibrating screens. The secondary crusher building has provision for installation of a second impactor and the screen house was built for installation of additional vibrating screens at a later date. A minus ¾-in. product will be delivered into the centralized storage area.

Clay in this area is gumbo-like and very sticky and difficult to handle. It will first be put through two 30-ft. wash mills each driven by a 200-hp. motor and then is to be pumped into a 110-ft. diameter clay storage basin of 23,000-bbl. capacity where it will be subjected to heavy air agitation. The clay slip will be pumped to the raw mills according to standard practice.

Storage Area

Among the interesting features of the plant are the covered storage area

(Continued on page 115)

Canada's Biggest Cement Plant

• **Montreal East plant supplies 30 percent of Canadian cement**

Canada's largest portland cement plant at Montreal East has a daily capacity of 18,000 bbl. of clinker (350-lb. bbl.), and ships cement by rail, truck and water. A true cement rock (argillaceous limestone) is excavated from quarry seen in background. The plant features six large wet process rotary kilns, one of the largest electrical precipitator stack dust collectors in the cement industry, and a storage capacity of 14 milion barrels

MODERNIZATION AND ENLARGEMENT of the Montreal East plant was largely completed by 1949 and all the major developments of the plant were discussed up to date and in detail in the August, 1949, issue of ROCK PRODUCTS, starting on page 127. Since that time, however, there have been certain changes and additions in operations which we briefly cover herein.

This plant is located ten miles east of Montreal and has a dock on the St. Lawrence River. It is by far the largest plant in Canada and produces in excess of six million barrels of cement annually. Daily production of clinker has been increased from 17,700 bbl. daily in 1949, when we described the main expansion program, to 18,000 bbl. through tightening up of operations generally.

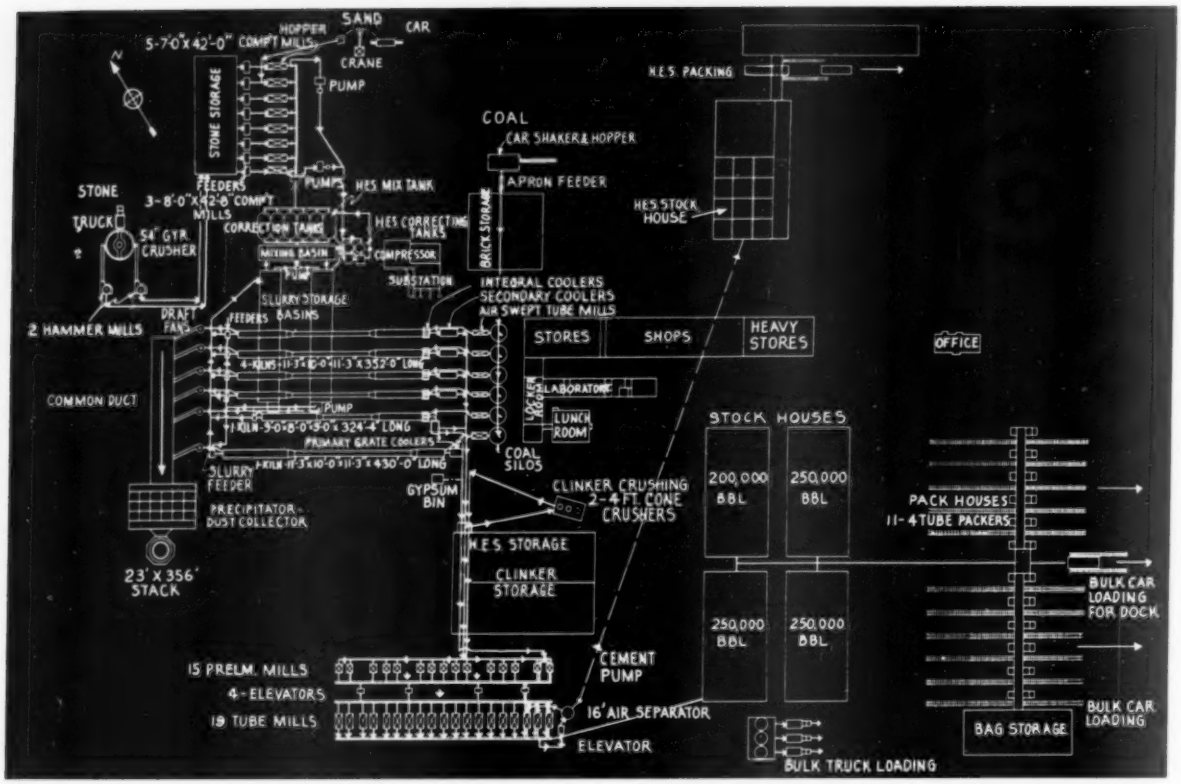
This plant has an enormous local market and has, for years, supplied the bulk of the cement north and to the east from Montreal. All shipments of the company into the Maritime provinces came out of the Montreal East plant until the Havelock, N. B., plant came into production in 1952. Shipments have run as high as 800,000 bbl. per month, including bulk and bagged cement by rail, by truck and by water. The S. S. Bulkarier supplies cement from this plant to the retail plants east from Montreal. About 30 percent of all Canadian cement is produced at the Montreal East plant.

The rock deposit at this location is a heavily-bedded argillaceous limestone very similar to that in the Lehigh Valley and is the only true cement rock in Canada. Only a small amount of high lime rock and siliceous rock is required to be added for the manufacture of cement. The quarry is drilled with 9-in. Bucyrus-Erie electric blast hole drills and, recently, a Joy Heavyweight rotary drill has been added. Loading in the quarry is by 3½- and 4¼-cu. yd. Bucyrus-Erie electric shovels. Haul to the plant is in diesel-powered Euclid trucks carrying 15 tons per trip.

Primary crushing is done by a 54-in. Traylor gyratory crusher which has a capacity of 800 t.p.h. of stone crushed to 6-in. top size. Secondary reduction is through two Pennsylvania SXT14 swing-hammer mills in parallel and mill feed size is reduced to ¾ in. minus. Storage capacity for crushed

Left: Recent installation of air quenching clinker cooler installed at right angles to one of Montreal East kilns

Right: Scoop dust return feeder on one of the kilns. Supply is from a silo by way of an airslide to the feeder



Layout of Montreal East plant which is largest cement mill in Canada

material is 32,000 tons.

Raw grinding (wet process) is done by five 7- x 42-ft. Unikom mills and two 7- x 46-ft. Unidan mills. They are all multi-compartment mills and the Unidans have slide-shoe bearings on the feed end. Grinding is in open circuit. Recently, an eighth mill, an 8- x 38-ft. Unidan, was added to increase output. Wilfley slurry pumps, standard in all the plants, handle the slurry to the correcting tanks, mixing basins, slurry storage basins and to the ferris-wheel kiln feeders. Slurry storage is 34,000 bbl.

There are six long rotary kilns. Four of them measure 11 ft. 3 in. x 10 ft. x 11 ft. 3 in. x 352 ft., the fifth is 9- x 8- x 9- x 324-ft. 4 in., and the sixth is 11 ft. 3 in. by 10 ft. by 11 ft. 3 in. by 430 ft. Four of them have Unax coolers and secondary coolers, and the 450-ft. kiln has the first Narsted air-quenching clinker cooler to be installed in a cement plant. Recently, a Narsted cooler was installed on kiln No. 5 in a rather unusual arrangement. It is at right angles to the kiln and is used, in part, as a conveyor. Each is direct-fired by an air-swept, compartmented tube mill with preheating first compartment. Heat for drying the coal is supplied in the 500-600 deg. F. range by drawing hot air from the kiln hood, and the coal-air mixture into the kiln is in the 190-200 deg. F. range. About 20 percent of the combustion air is preheated primary air.

Each kiln is highly instrumentalized with an F.L.S. centralized control panel. Kiln No. 6 is producing clinker in the 940,000 B.t.u. per bbl. range and the others are running a little higher. All of the kilns have been forced in recent years with attendant sacrifice in fuel efficiency. Each kiln has Magnecon basic brick in the hot zone and the lining throughout is similar to those discussed in the accompanying articles. The kilns have very few automatic firing features.

Finish grinding of standard portland cement is accomplished by two stages in open circuit. The finish mill comprises fifteen No. 85 kominuters and nineteen No. 18 Smidth tube mills. Three of these tube mills are in closed circuit with 16-ft. Sturtevant mechanical air separators in the production of high early strength cement. All clinker is first crushed through two 4-ft. Symons short-head cone crushers to ⅜-in. top size.

Cement storage in stockhouses and concrete silos totals 1¼ million barrels and there are twelve 4-spout St. Regis packing machines. In the late 1940's, three large silos were constructed for truck-loading because of the trend to that form of shipping. Already they have become inadequate as the trend continues to grow. Bags are received on pallets and handled in the packing plant by fork-lift trucks.

Dust Collection

The raw materials in this plant are unplastic, resulting in nodules in the kilns that are not strong so dusting is comparatively heavy. Under forced firing conditions the loss of dust through the stacks has amounted to 35-40 lb. per bbl. of clinker, resulting in the raw material requirement per bbl. of clinker increasing from 555 lb. to 585 lb. The loss of dust through the stacks from the six kilns amounts to 300 t.p.d.

Dust became a serious problem because of complaints and due to the heavy loss of material. In 1950, a Cottrell electrical precipitator of 750,000 c.f.m. capacity was installed to handle the dust from all six kilns. A common duct carries the gases into the collector and the exhaust is through a 23- x 356-ft. concrete stack. The collector is a 6-unit, 3-section Cottrell with a 25-duct rod curtain assembly and 20-duct pocket electrode assembly.

Difficulty with mud rings was encountered in attempting to return the dust into the kilns with the slurry, with the result that until recently all the dust was discarded. This presented a serious disposal problem that was solved by pug-milling the dust into a

thin slurry which was allowed to flow out into a dammed up disposal area near the quarry.

Six F-H Airslides transfer the dust from the collector to a common screw conveyor delivering to a F-K pump. Recently, a scoop dust return feeder was installed on kiln No. 6 and part of the dust is being returned dry below the chain section. It is first pumped into a silo from which an airslide and bucket elevator handle the dust into the scoop feeder. This was experimental, using various rates of feed of dust, before deciding whether or not to equip the other kilns for similar dust return.

As a result of this trial, a large bin is being completed adjacent to the Cottrell, into which all the dust will be pumped. The silo has porous aeration block on the bottom to keep the dust in a fluid state. Dust will be withdrawn and elevated overhead, with an airslide delivering to the separate scoop feeders to be installed.

Fort Whyte Plant

(Continued from page 112)

for limestone, clinker, gypsum, iron cinders and sand. It is unusually wide, with a 120-ft. span, and will have an overhead travelling crane with 5-cu. yd. clamshell bucket featuring Ward-Leonard control. The reason for the 120-ft. span is one of economics. Due to the spongy clay soil in the area it is necessary to carry the sidewall foundations to bedrock. A 60-ft. depth to bedrock and the need to drive caissons is expensive, making it cheaper to build high walls and use a wider span rather than have a longer storage area. The retaining walls are to be 4 ft. high and length of the storage area will be 400 ft.

This is probably the first use of Ward-Leonard control in the cement industry for the drive of an overhead electric bridge crane. Ward-Leonard was selected for this use because of its smooth torque characteristics, to eliminate snapping of the cables, to attain higher speed of operation and for more accurate spotting of the clamshell bucket. It is anticipated that maintenance cost will be lower than with conventional a.c. motor drive.

Raw Grinding

Limestone is to be ground in open circuit through two No. 2414 Smidth Unidan compartment mills. They measure 8 x 46 ft., have 1000-hp. synchronous motors with Symmetro drives and have slide shoe bearings on the feed end with conventional trunnion bearings on the discharge end.

It is difficult to grind the sand available in the area, so that chip sizes will not remain in the final product, so a separate 6- x 36-ft. tube mill driven by a 400-hp. motor will first wet-grind the sand, for feed as a slurry into the Unidans by ferris-wheel feeders.

Slurry will be pumped into six correcting tanks measuring 20 ft. diameter by 40 ft. high, and holding 1500 bbl. each, to be blended out to a sump and then pumped into a 110-ft. diameter slurry storage basin without recirculation. From this storage, the transfer is by slurry pump to the kiln ferris-wheel feeder, which is tied by generator to the kiln drive. Kiln feed will be ground to 90 percent passing the 200-mesh sieve and will contain 34-35 percent water.

The single 12- x 450-ft. rotary kiln will be fired by oil. It will be driven by Ward-Leonard control and discharge clinker over a 6- x 50 ft. Narsted air-quenching clinker cooler and be exhausted through a Multiclone stack collector by induced draft. Dual draft fans are to be used because a single fan of the design preferred would not have sufficient capacity at peak production. The company prefers fans with a bearing on one end with cantilever rather than the larger fans which are of two-bearing design. Dry dust is to be returned by scoop feeder into into the kiln below the chain section.

Air-quenched clinker will be put through a 4-ft. Symons short-head cone crusher for reduction to ⅜-in. top size and then conveyed into storage. Finish grinding will be single-stage through two 11-ft. x 15-ft. 6-in. Smidth ball mills mounted on slide-shoe bearings and driven by 1000-hp. motors with Symmetro drives. Each mill will be in closed circuit with two 14-ft. Sturtevant mechanical air separators. It is estimated that the circulating load will approximate 500 percent. Finished cement is to be transported by F-K pump into the existing stockhouses. The manufacture of masonry cement is contemplated.

The Hull, Quebec, plant was the first to install a new long, wet process kiln back in 1929. This is a single kiln plant with quarry adjacent. It is well landscaped, and has completed well over nine consecutive accident-free years to date

HULL PLANT

THE HULL, QUE., PLANT was the first mill of the company to install a new long, wet process kiln and that was back in 1929. It is an 11-ft. 3-in. x 10-ft. x 365-ft. Traylor kiln with Smidth Unax cooler, direct-fired by a B & W type 144 coal mill. Rated capacity is 2500 bbl. per day but the plant has been producing an average of 3000 bbl. per day throughout the period of high demand.

The quarry is adjacent to the plant and the primary crusher, a 48- x 60-in. Traylor jaw crusher, is followed by a reversible hammer mill to reduce the stone to mill feed size. Stone is transferred into storage by an inclined belt conveyor. Clay is put through a 26-ft. wash mill and handled and stored in the conventional way.

Raw grinding is through two 7- x 39-ft. Unidan mills in open circuit and the finish mill comprises two-stage grinding. Mills include six Krupp ball mills, and seven 5- x 22-ft. tube mills closed-circuited with two 16-ft. mechanical air separators.

In 1952, a Buell mechanical dust collector was installed for stack dust, and the dust is being returned by Smidth scoop feeder into the kiln.

The cement storage at this plant consists of six 50,000-bbl. silos, with the packhouse being of modern design, having four floors and basement. There are three St. Regis No. 111 F. C. packers and facilities for loading cement, both in bulk trucks and cars.

The office and laboratory building is a modern structure having a full basement, plant office on the first floor and physical and chemical laboratory on the second floor.

This plant completed nine consecutive accident-free years on March 20, 1954, and is still accident-free to date.

Exshaw plant of Canada Cement Co. is in a picturesque location in the Canadian Rockies. Left to right are crushing and screening plant, raw material storage, kilns and stockhouses to the extreme right. Belt conveyor to right of kiln stacks leads to clinker storage silos. Quarry is on top of mountain to left (out of picture), and cement village of Exshaw is in background

Increase Exshaw, Alberta, Plant to Nearly Four Times Pre-War Output

• Mountain quarry employs rotary drill and heavy-duty trucks for downhill haul. Natural gas used to fire kilns

CANADA CEMENT CO.'S westernmost cement mill is at Exshaw, Alberta, on the Banff-Calgary highway. It is located about 60 miles northwest of Calgary and at the very gateway to the snow-capped mountains of the Canadian Rockies, 24 miles from the world-famous Banff Springs resort.

Exshaw is in a picturesque setting, surrounded on every side by mountains reaching up to 10,000 ft. elevation. It is a company-owned village on the Canadian Pacific Railroad, with individual homes and a modern hotel in which accommodations are available for single employes. Restaurant facilities are available in the hotel at moderate prices, and recreational facilities including bowling, billiards and a library and reading room have been provided.

The original plant at this location was built in 1907 by the Western Canada Coal and Cement Co. and financed by British capital. It was a dry process plant with coal-fired 9½ x 150-ft. rotary kilns until after Canada Cement Co. took it over and later converted it to the wet process in 1939.

Demands for portland cement from this plant have been extremely heavy for at least ten consecutive years and continue to tax the capacity of the plant in spite of two major postwar II expansion programs. It is entirely a rail-shipping plant and shipments are made into British Columbia to the west, into Saskatchewan to the east, and throughout the vast Province of Alberta from the U.S. border on the south and as far north as cement might be required.

There have been many sizable construction projects throughout this area in the past decade and the continuing oil boom has taken a large percentage of the shipments for oil-well cementing. Simultaneously, cities like Calgary to the south and Edmonton to the north, along with others in Alberta, have had unprecedented growth and expansion. Demands for bulk cement have grown from practically nothing ten years ago to almost one-third of all cement shipments. Practically all production is of standard portland cement but a small amount of high-early-strength portland cement is produced.

Until expansion was started following World War II, the plant had a rated annual capacity of 800,000 bbl. A single 10- x 278-ft. Traylor rotary kiln with Unax cooler was in production. In 1947, a 10- x 310-ft. Smidth kiln with Unax cooler was installed, with accompanying increases to milling capacity, raising the annual capacity of the plant to 1,600,000 bbl.

The second expansion program starting in 1951 and continuing into 1953 almost doubled the capacity and raised daily output to 8500 bbl. That enlargement program was of a scope that amounted to virtual building of a new plant with capacity in excess of

1¼ million bbl. a year. It comprised the opening and development of a new quarry, the building of a completely new crushing and screening plant, a new covered storage for raw materials, the installation of new grinding mills in the existing raw mill building to double capacity, installation of an 11-ft. 3-in. by 430-ft. Smidth kiln with Narsted air-quenching clinker cooler, the building of two large slurry storage basins and reinforced concrete clinker storage silos, and a completely new finish mill. The old stockhouses for finished cement have been retained and the old crushing plant has been left intact for supplemental use in the handling of shale. Natural gas became available locally in 1951 and Exshaw is the only plant of the company with gas-fired kilns.

Raw Materials

Raw materials consist of limestone from a quarry nearby the plant, shale excavated at a quarry six miles distant, and iron cinders shipped in by rail.

The entire mountainous area around Exshaw is of dolomitic limestone and nearly all of it is unsuited for cement manufacture except for the mountain adjacent to the plant which consists of a succession of beds, variable in thickness and variable in calcium carbonate and magnesium carbonate content. These beds have a dip of 43 deg. and are being excavated in horizontal cuts through all the beds which yields a mixture of stone from the many strata that is well within the limitations for magnesium carbonate. The thicker beds contain a percent or two of MgO and there are thin beds between, that run as high as 10 or 12 percent MgO, with variations between. A new "mountain quarry" is under development on two levels and, at present, practice is to proportion the number of truckloads from each shovel according to the type of stone being quarried. A typical analysis of the limestone would run 1 percent SiO_2, 4 percent Al_2O_3, 0.2 percent Fe_2O_3, 52.9 percent CaO, 1.9 percent MgO and 43.4 loss on ignition.

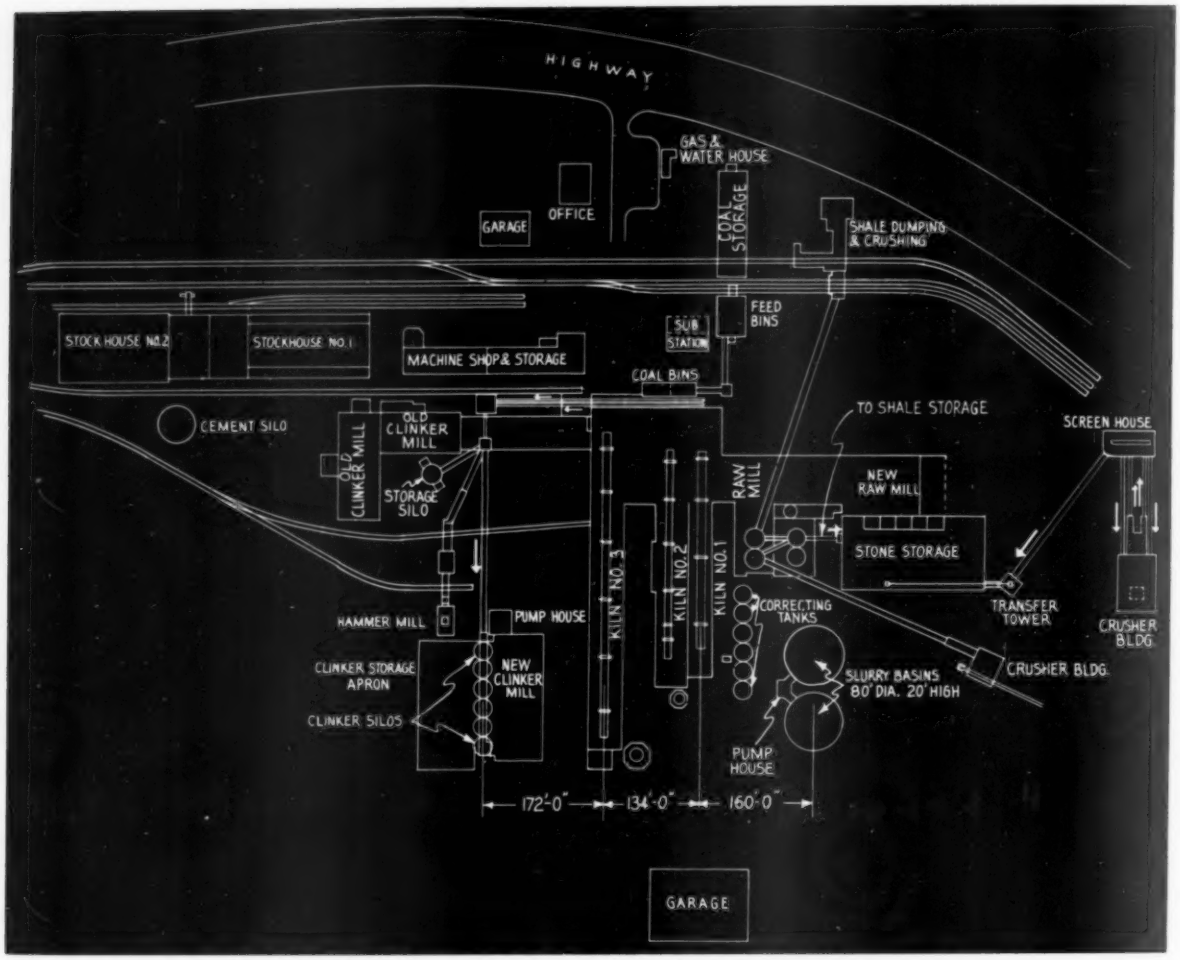
The shale is high in silica and very abrasive. It is excavated selectively in a two-bench operation because parts of the deposit exceed 70 percent silica. A typical analysis, as supplied the mill, is 65.5 percent SiO_2, 13.3 percent Al_2O_3, 5.1 percent Fe_2O_3, 2.0 percent CaO, 2.2 percent MgO and 7.1 percent ignition loss. Iron cinders average 7.6 percent SiO_2, 4.3 percent Al_2O_3, 76.8 percent Fe_2O_3, 1.6 percent CaO and 1.0 percent MgO.

Approximately 20 percent of the raw mix is shale. Iron cinders are mixed with the shale in the ratio of 1 part to 16 and the mixture is proportioned along with the limestone

A new quarry atop a mountain is under development. Excavation is on two levels using a rotary drill for most of the drilling. Haul to the crushing plant is by heavy-duty, large capacity trucks, with special auxiliary brakes, travelling steep grades downhill

A bedded limestone with 43 deg. dip is being quarried. The new quarry is above, and the cut is horizontally across the dipping beds. Formerly all the limestone was quarried by tunnel drilling from below

Showing steeply dipping limestone in the background. New quarry is atop limestone. Foreground shows transfer point for delivery of stone into storage



Layout of Exshaw, Alberta, plant after completion of second enlargement program

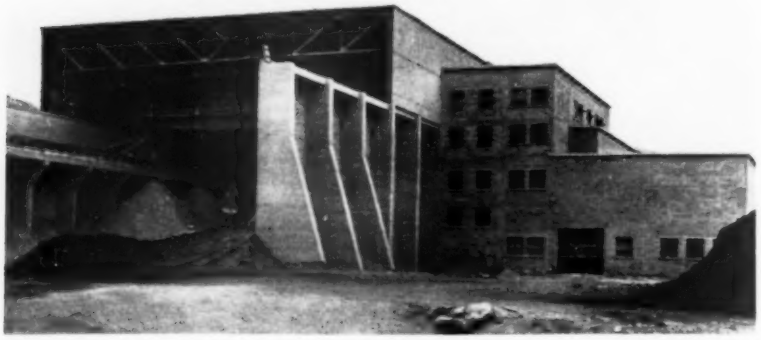
into the raw mills. Daily requirements are 2200 tons of limestone, 540 tons of shale and 30 tons of iron cinders.

Quarrying

Quarrying operations atop the limestone mountain are still in the development process and involve the levelling off of the mountain top. Workings are proceeding on two levels.

The decision to work the mountain from above was made in the interests of safety, although operations still continue in the lower quarry which has been operated for many years. The inclined beds of stone have a dip of 43°10′SW and the strike is N 32½° W. Vertical height from the lower quarry floor to the lower bench above is in excess of 400 ft. vertically. In working the lower level, tunnel drilling has been practiced and advantage had been taken of the crushing action of the stone itself in sliding down the sloping bedding planes. The lower quarry has been developed to a length of 1200 ft. and is 300 ft. in width. Its elevation is about 40 ft. higher than the crushing building. The constant threat of slides burying the shovels below was the reason for developing the new quarry above. Working continues on a moderate scale in the lower quarry as the new quarry is being developed, which is possible because conditions have stabilized since blasting from below was discontinued.

Building an access road to the upper quarry was a considerable undertaking and was accomplished in 1951 and 1952. It is a winding road, circling the mountain, with sharp curves, and has grades as much as 15 percent at some points. Length of the road is 4900 ft. from the crusher building up to the main bench and it extends an additional 1000 ft. on up to the top where the second of



Storage area for raw materials, including limestone, shale and iron ore cinders, is served by bridge crane on 100-ft. span. Stone belt conveyor with tripper is on left; to the right is the raw mill building

two shovels is operating in cutting off the top of the mountain. When fully developed, two 50-ft. benches will be under excavation.

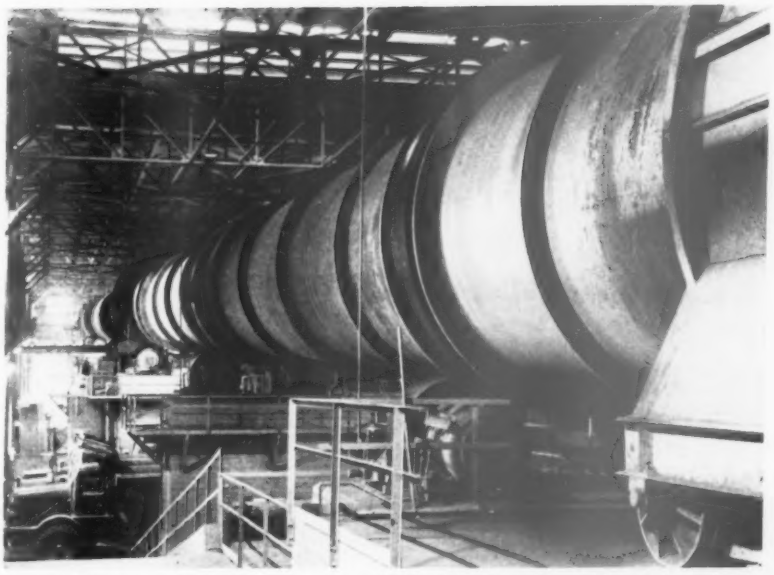
At present three wagon drills are continued in service for levelling off purposes, but most of the drilling is being done by a Joy Heavyweight Champion rotary drill which has been in operation for two years. This drill will be capable of handling total requirements, once the quarry is fully established. Thusfar it has had to be operated under anything but favorable circumstances. It has had to be anchored with bulldozers on edge work and has negotiated grades as high as 25.2 percent when being relocated.

The drill is crawler-mounted, with a 30-ft. derrick and is levelled by hydraulic jacks. It uses 6¾-in. Hughes Tricone bits and most of the drill holes are from 50 to 55 ft. in depth. The normal pattern will be a burden of 14 ft. and spacing of 17 ft., firing 5 or 6 holes to the blast. Blasting is done by C.I.L. 60 percent and 40 percent Polar Ammonia type explosives in cartridges.

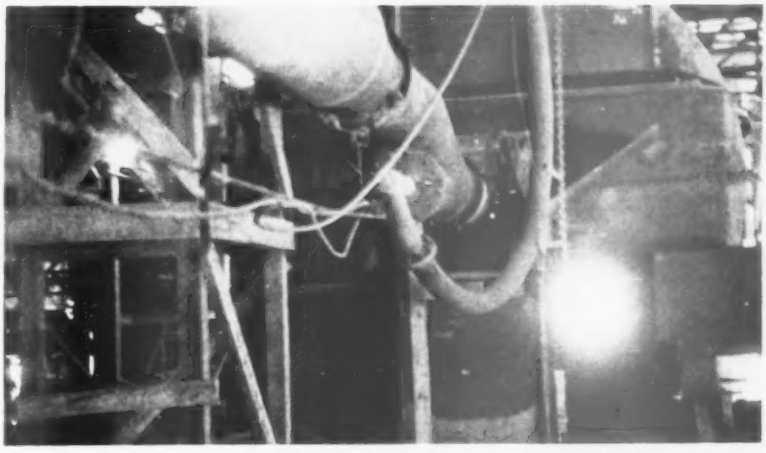
Performance of the drill cannot be compared with older methods in this quarry, because it supersedes tunnel drilling and the use of jackhammers. The stone is a hard stone on the average, but the different ledges vary considerably in degree of hardness or softness. Minimum footage is 50 ft. of hole per day and the maximum is 130 ft. in softer limestone. The average is 100 ft. per day for 7 hr. including time required for moving and setting up, lunch-time and all other attendant delays, or approximately 15 ft. per hr. Bit life has averaged 1936.8 ft. according to records for 19 bits.

Excavation in the upper quarry is by two 3¼-cu.yd. Bucyrus-Erie 85-B Caterpillar-mounted electric shovels and, in the lower quarry, by a 2½ cu. yd. Bucyrus-Erie electric shovel. Haulage from the upper quarry is in five model 31-TD Euclid trucks powered by 4-cycle, 300-hp. supercharged Cummins diesel engines. They have 10 forward speeds, two in reverse, and are equipped with hydraulic steering. They have 15-in. Hydrotarder type auxiliary hydraulic brakes. These brakes, which are manufactured by Parkersburg Rig and Reel Co., Parkersburg, Va., are specially designed for the control of speed on long or steep grades. They are mounted on the drive shaft behind the transmission and receive their water supply from a large tank mounted above the cab. They function independently of the mechanical brakes.

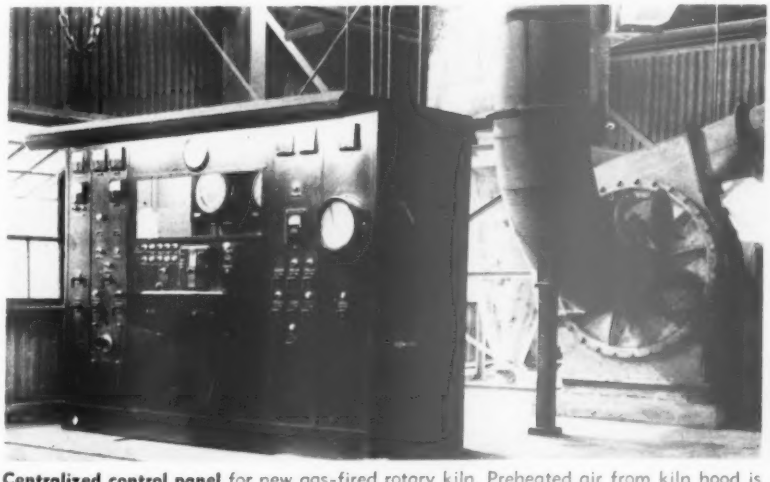
Any desired rate of speed can be maintained through the use of a control rod on the dashboard, without



Newest kiln is gas-fired 11-ft. 3-in. by 430-ft. kiln shown here. Trucks from below may drive up ramp to burner floor



Kilns at Exshaw plant are fired by natural gas introduced into the kiln with preheated air. Burner is adjustable horizontally to change the position of flame on lining



Centralized control panel for new gas-fired rotary kiln. Preheated air from kiln hood is injected into kiln with natural gas by fan on right

One of the electrical-powered shovels loading large capacity end-dump truck on upper level of mountain quarry

requiring application of the regular brakes or drag on the engine to slow a truck.

By thus permitting controlled travel speeds downgrade, these trucks are safely hauling up to 30 tons of stone per load to the crushing plant. Capacity is actually 22 tons struck measure.

Haulage equipment for the lower quarry comprises three International KR-11 model trucks with Easton Phoenix model TR-10 side-dump trailers. These units are rated at 8 cu.-yd. and haul 12-14 tons per load.

Crushing-Screening

The limestone crushing plant is in a separate structure from the screening operation, with gallery-enclosed belt conveyors for transfer between the two buildings. They were completed in 1952 and are of very permanent construction, of 12-in. reinforced concrete and structural steel construction with corrugated iron siding and roofs built of 4-in. Haydite concrete channel slabs.

A 54-in. type T Traylor gyratory crusher driven by a 350-hp. G. E. wound rotor induction motor has replaced a smaller gyratory crusher, and feed hopper arrangement was designed to permit receiving stone from both the end-dump trucks and the side-dump trailers. The latter are discharged by an Easton hook assembly operated by a 5-ton electric hoist. A 56-ton Provincial crane was provided over the crusher for the handling of heavy parts.

Stone of 6-7-in. top size is divided from the primary crusher to two 54-in. style F Stephens-Adamson pan conveyors, 96 ft. in length, which feed into two Pennsylvania CF-15-50 reversible impactors. These crushers are driven at 685 r.p.m. by 500-hp. wound rotor induction motors and have a capacity of 450 t.p.h. each when producing a minus ¾-in. product in closed circuit with vibrating screens. The crusher building is vented by two 18-ft. No. 102-360 Sly dust filters.

Stone from each impactor is delivered into the screen house over a 36-in. belt conveyor, 180-ft. centers, and the stream is divided over a pair of 5- x 14-ft. single-deck Dillon vibrating screens in each case. The screens are of full-floating circle throw type and have Ton-Cap screen cloth of ⅝- by 5-in. openings with the slots horizontal across the screens. Short belt conveyors transfer the oversize from each pair of screens over 30-in. belt conveyors on about 180-ft. centers for return to the impactors. Fines are transferred by a 42-in. belt conveyor on to a second 42-in. belt conveyor, approximately 270-ft. centers, for delivery to a transfer tower just outside the covered storage area paralleling the raw mill building. From the transfer tower, the stone is conveyed within the covered storage area over a 42-in. horizontal belt conveyor on 170-ft. centers. Discharge into storage is by a No. 234 type C self-propelled, 42-in. wide automatic belt tripper with discharge chute, travelling on a 124-ft. 10-in. track. The tripper and belt conveyors are of Jeffrey manufacture. Two No. 85-360, 15-ft. Sly dust filters vent the screening plant.

Shale

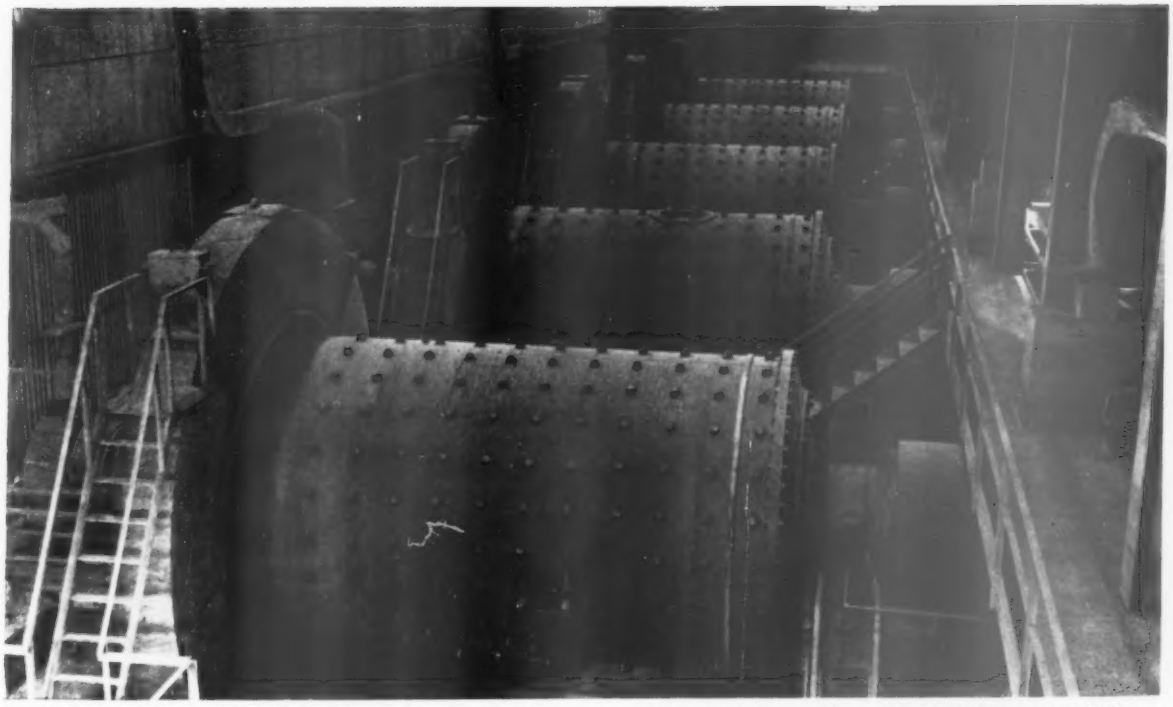
Shale is excavated from a quarry six miles distant, which is operated on two levels. Drilling is done by a 22T Bucyrus-Erie electric blast hole drill and an Ingersoll-Rand FM-2 wagon drill. Excavation is with a ¾-cu.yd. diesel-powered P & H shovel and a 1½-cu.yd. Dominion No. 450 diesel-powered shovel, loading into two 15-ton Euclid trucks which transfer to drop-bottom gondola railroad cars for delivery to the plant.

Shale cars dump into a hopper at the plant and two 54-in. pan conveyors in series deliver the shale into a Pennsylvania wide-mouth C15-50 impactor driven by a 350-hp. wound rotor induction motor with reversing controls. A 36-in. belt conveyor delivers the crushed shale into a storage silo from which it is drawn by 24-in. belt conveyor for transfer into the covered storage area adjacent to the raw mill building. The shale plant is vented by a 7-ft. cyclone and No. 136 Sly type 360 dust collector. Standby facilities for the handling of shale are the old crushing plant and stone storage which were left standing for the purpose. Iron cinders are handled from railroad cars by belt conveyor into the covered storage area.

Raw material storage

Raw material storage is in a covered area paralleling the raw mill building. It measures 200 ft. in length and has a 100-ft. rail span for a 12½-ton Provincial bridge crane with 3½-cu.yd. Blaw-Knox clamshell bucket. Height is 44 ft. 3 in. to the crane rails. Side walls are of reinforced concrete carried to solid rock. The enclosure is of transite siding and the roof is of steel trusses with Haydite concrete channel roof slabs. A parti-

Clinker is stored in six reinforced concrete silos, and overflow storage is provided alongside for reclaiming by bull dozer and belt conveyor. Structure adjoining is new finish mill



Cement is ground through five 9-ft. 6-in. by 18-ft. 5½-in ball mills, each in closed circuit with a mechanical air separator. Mills are fed clinker mixed with gypsum by single table feeders

tion separates the shale and iron cinders from the limestone. Capacity is 6070 tons of shale and 12,800 tons of limestone, when filled to the top of the feed bins and partition walls. Five mill feed bins were built along the raw mill building wall, of which four are in use.

Raw Mill

All grinding mills are of F. L. Smidth manufacture. With one-kiln operation, before World War II, there were two Unidan 2-compartment mills run in open circuit. Two additional mills of the same type and size were required when kiln No. 2 went into production. Kiln No. 3 required that raw mill output be doubled. Two ball mills were installed for preliminary grinding in closed circuit with vibrating screens and a fifth Unidan mill was added. The five Unidans are of standard design, with self-aligning trunnion bearings and the older ones were converted into a modified tube mill design to carry a smaller size of grinding ball. They are run in open circuit.

Preliminary mills are 9-ft. 6-in. diameter by 15-ft. 10-in. ball mills driven at 22 r.p.m. by 600-hp. G.E. synchronous motors connected to 13-ft. drive shafts. They carry a grinding charge of 46,000 lb. of 3-in. and 46,000 lb. of 2½-in. forged steel grinding balls.

Originally, provision was made to use a separate feed bin for iron cinders with an apron feeder and belt conveyor as the means of feed into the mills. This system is not in use and the cinders are being fed to the mills along with the shale. The two materials are charged into one feed bin in approximate proportions of 16 parts of shale to one of cinders. Thus, each preliminary mill is fed from two feed bins.

Feed is regulated, for each mill, by a pair of interlocked size C Hardinge variable-speed constant weight feeders driven by d.c. motors through Reeves variable speed drives. The short feeder belts transfer to a 20-in. belt conveyor for direct feed into the mill. A 6-in. Wilfley slurry pump delivers the discharge from each mill overhead into a distributing tank which divides the stream of slurry, from each mill, over three vibrating screens. Wilfley slurry pumps are standard equipment throughout and, in each case, a spare is provided.

Slurry screens are Ty-Rock type F-600 single-deck screens arranged in two rows of three. The water is added over the screens, for a slurry consistency of 34 percent water. They carry 14-mesh wire cloth and rejects from each bank of screens are returned into the mill through a spout. The circulating load is 200 percent.

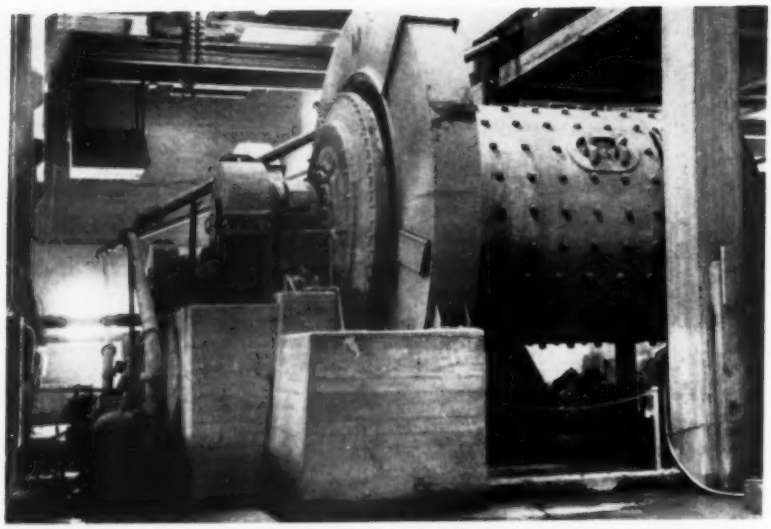
Fines from each bank of three screens are transferred by 18-in. cross screw conveyors (2) into a 24-in. screw conveyor which delivers into a slurry surge tank near the Unidan mills.

A 6-in. slurry pump draws from the slurry surge tank and transfers overhead to a seven-compartment feeder, or distributing tank, for the Unidan mills. The flow into the feed pipe for each mill is controlled by V-notch gates from the feed trough, and the excess returns into the surge silo.

The Unidans are No. 2288, 6-ft. 3-in. by 30-ft. mills driven by 600-hp. 0.8 p.f. synchronous motors. They carry 44 tons of 1¼-in. and 1⅛-in. forged steel grinding balls. Screw conveyors are the means of transfer of the output from the mills into a common sump for delivery by 6-in. slurry pump into slurry correcting tanks. Production of the ball mills is 195 bbl. per hr. each, supplying 390 bbl. per hr. of feed for the Unidan mills. Each Unidan mill produces 93 bbl. per hr. of a 92 percent minus 200-mesh product.

Normally, two ball mills and four Unidan mills are operative in supplying the kiln requirements. The fifth secondary mill is a reserve. A single ball mill circuit may be operated with two or three secondary mills, which is sometimes done in balancing the overall mill power load since peak power loads govern during the summer months. Ten-ton overhead Provincial cranes (2) facilitate the handling of heavy parts in the mill room and the electric motor room.

Slurry storage and blending capacity was greatly enlarged in the 1951-1952 program and the plant is well-



Raw grinding is two-stage with two ball mills closed-circuited with wet type vibrating screens, followed by open circuit finish grinding through compartment-type mills. Pump on left of ball mill delivers overhead to three vibrating screens in parallel

equipped for a thorough job of blending. There are the six original air-agitated slurry correcting tanks, and in addition two large capacity slurry storage basins, connected in tandem, that serve as both mixing basins and kiln feed storage. Normal practice is to pump the slurry from the grinding mills into any one of the six correcting tanks and to draw calibrated amounts from them in pairs (by 8-in. slurry pumps) for transfer to the No. 1 slurry storage basin. The slurry then flows through the inter-connecting pipe into the No. 2 storage basin, and thence to the kiln feed pumps. This has proven to be an excellent mixing method, as shown by the very small deviation from the lime holding point. Overflow from the kiln slurry feeders is returned to tank No. 1.

These basins are similar in design to those at the Belleville plant and are very impressive structures. They are circular and each has 100,000 cu.ft. capacity or 12,000 bbl. of slurry. Measuring 80 ft. outside diameter, they are 21 ft. 6 in. to the top of the 18-in. thick reinforced concrete wall. Effective slurry storage is to a depth of 20 ft. Structural steel columns and trusses support a roof of Haydite concrete slabs and the superstructure is enclosed with Transite siding.

A travelling agitator bridge of Smidth design has a 6-ft. diameter center pier support and the outer end travels around the circumference on 60-lb. rail. Each wheel has a 5-hp. drive motor and the rate of speed is 100 f.p.m. or 2.54 minutes per revolution.

Slurry is fed into a center conical tank around the center column from which a trough leads to downspouts along the bridge. Three sets of compressed air pipes spaced along the bridge introduce air into the slurry on a timed cycle for agitation. Drag bars keep the bottom of the basins free of solid deposit. Air for agitation is supplied by a No. 380 Fuller rotary compressor rated to deliver 400 c.f.m. at 25 p.s.i. It is mounted on the travelling bridge. Two Smidth handwheel-operated gate valves release slurry to either of two pumps for transfer into the second basin, if additional blending is required. The pumphouse for delivery to the kilns is between the two basins with connecting branches to both. Slurry is pumped from the second basin into a line with separate branches to the three kiln ferris-wheel feeders. The overflow from each kiln feeder is piped to an overflow tank near kiln No. 3 from which a 6-in. pump returns the material to the basin.

Kilns

The three kilns are fired by natural gas and each is exhausted by induced draft through a separate stack. Both of the older kilns have Unax integral coolers and have secondary shaking coolers. Kiln No. 1 is presently being equipped with a Narsted air-quenching clinker cooler. Average production from kiln No. 1 (10 x 278 ft.) is 2200 bbl. per day; kiln No. 2 (11 x 310 ft.) is 2350 bbl.; and for kiln No. 3 (11 ft. 3 in. by 430 ft.) is 4000 bbl.

All three kilns are being forced for maximum production at a sacrifice in fuel. Natural gas is delivered to the kilns at 27 p.s.i. and is stepped down to 5 p.s.i. at the burner tip. Its heat value is 1060 B.t.u. per cu.ft. Gas requirement averages 1350 cu.ft. per bbl. for kiln No. 1, 1330 cu.ft. for kiln No. 2, and 1230 cu.ft. for kiln No. 3, total requirement averaging 9,350,000 cu.ft. per day. The two older kilns are turned at a speed of 51-52 r.p.h. and kiln No. 3 rotates at 55-56 r.p.h.

New Kiln

The new 11-ft. 3-in. by 430-ft. rotary kiln is identical in size and design to the large Belleville kiln. It was installed in a new 44- x 507-ft. kiln building and has a ramp which permits trucks to drive right up to the burner platform. The kiln carries a slope of ½ in. and is exhausted through a 155-ft. Custodis stack by a No. 60 FLS induced draft fan which has a capacity of 202,000 c.f.m. and is driven at 720 r.p.m. through Texrope by a 200-hp. motor. Rate of slurry feed is tied to kiln speed like in the other plants. The kiln drive is a 100/150-hp. G.E. d.c. motor with 18.75 kva. generator to drive the ferris-wheel feeder motor. A Continental No. B427 gasoline engine is the emergency drive.

Lining of the kiln is similar to that in other plants described and specifically consists of 9 ft. of 12-in. Super-duty refractory; 9 ft. of 9-in. 70 percent alumina; 42 ft. of 9-in. Magnecon; 40 ft. of 9-in. 70 percent alumina; 108 ft. of 9-in. Super-duty refractory; 114 ft. of 6-in. High duty refractory; and 108 ft. of hard, dense, wear-resisting throughout the chain section of the kiln to the feed end. The chain section is approximately 100 ft. in length.

Clinker is discharged over a 49-ft. 4-in. by 6-ft. 6-in. Narsted air-quenching clinker cooler from which air is preheated through the primary section for introduction into the kiln. Air of low preheat through the secondary section of the cooler is exhausted through a Multiclone stack dust collector. This cooler has a clinker chunk breaker at its discharge end and clinker is cooled to 200 deg. F. The primary air fan for the cooler is a No. 11 type SLD fan driven at 1180 r.p.m. by a 300-hp. motor, with a capacity of 106,000 c.f.m. at 11.6 in. w.g.

Preheated primary air is drawn from the kiln hood through a 6-ft. cyclone ahead of the firing fan, with the cold air tempering inlet maintained for a temperature of 225 deg. F. About 12-16 percent of the kiln combustion air is introduced with the gas, for a short, intense flame, and the balance is preheated air from the air-quenching clinker cooler. Gas supply is through a 6-in. line and rate of flow is recorded by a Foxboro recorder.

The kiln has a centralized control panel with the usual array of instruments. Among recording charts are those for the induced fan duct temperature, kiln feed end temperature, sec-

(Continued on page 157)

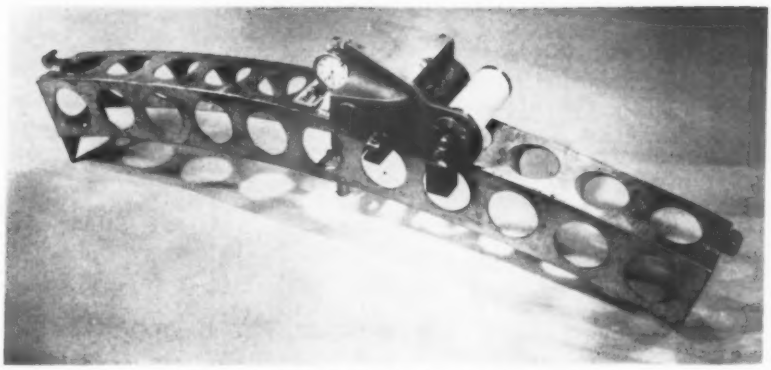


Fig. 4: A Shelltest recorder fixed to the gauge

Fig. 1: Shelltest device fixed to a kiln

By F. G. ROSENBLAD*

Detecting and Measuring

Radial Deformations of Rotary Kilns

MECHANICAL DEFORMATIONS in a rotary kiln are generally of great importance in the wear of rolls and tires, the life of the lining, and in fact, to the entire kiln operation. More engineers have become aware of this during recent years, and a couple of new tire designs have appeared, with properties different than older types, including a movably-mounted tire. A gauging device also has been invented which, together with a measuring method, simplifies the controlling of the deformations of the shell during normal operation. This device, called "Shelltest" has been developed and tested at Skånska Cementaktiebolaget in Sweden. The tests have proved that this gauge, which is a very simple and handy instrument, will give full information about the mechanical shape and the condition of the kiln, about the alignment of the rollers and the tires, which, by means of other measuring methods, would have been rather difficult if not impossible to determine with the same degree of accurateness. As most technicians working with rotary kilns must be greatly interested in the measuring experiences that have been carried out, some of the results will be discussed. In connection with these measurements, one of the tire constructions also will be discussed.

Mechanical Deformations of Rotary Kilns

There are different types of mechanical deformations of rotary kilns. Torsion and bending stresses along the shell will generally not cause any dangerous deformations, as the moments of inertia are usually rather great in comparison with the torsion and bending forces. Deformations most dangerous to the lining are caused by forces that convert the kiln cross section to an ellipse instead of a circle, except those deviations of the form at the points where the supporting rollers are pressing against the tires. A section through a kiln perpendicular to its axis generally has such a form, which means that each point of the shell during a revolution follows the outline of an ellipse instead of that of a circle, which should have been the case if the kiln had been absolutely rigid. A part of the circle curve of the shell will thus, during a revolution, assume a different radius of curvature. It is obvious that such changes in the radius of curvature of the shell are not good for the lining under the shell. These changes of the radius of curvature and the deformations caused thereby can be measured with the Shelltest instrument.

Functions of Testing Apparatus

Shelltest consists of a practically rigid beam, at the ends of which are tips that rest against the shell during the measuring. The distance between the tips is one meter. Shelltest will thus stretch over a circular curve, the cord of which is of this length. In the center of the beam is a spring-loaded pin, on the extension of which an indicating instrument is attached, in order to indicate the axial movements of the pin in relation to the center of the beam. During the measuring, Fig. 1, the spring-loaded pin is resting against the shell of the kiln. The difference between the greatest and the smallest deflection of the indicating instrument during a revolution corresponds to the maximum variation of the elastic deformations relative to the tips of the beam and ought to be a measure of the stress in the lining caused by the radial deformations.

The beam is attached to the kiln

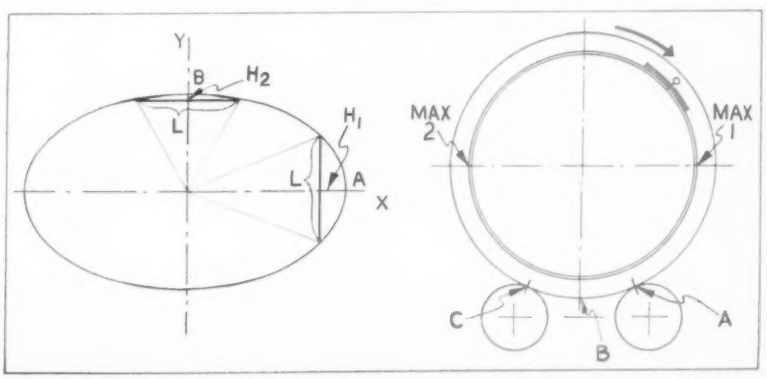


Fig. 2, left: Showing the relation between the differences in the deflections of the indicator and the ovality. Fig. 3, right: Different points for readings of Shelltest device

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by means of a chain, a spring and a tensioning device and may then follow the kiln round during its normal operation. When the kiln is stopped, it is generally of less interest to make any deformation measurements. Besides, Shelltest is not specially adapted for such measurements as the accidental variations of the radius of curvature of the shell are usually much greater than those of a revolving shell.

The rigidity of the kiln shell often is expressed by the concept "ovality"; i.e., the difference between the diameters of the big and the small axis of the ellipse, which a point on the shell is supposed to follow during a revolution. When the kiln is stopped, it is rather simple to state this difference in diameters by measuring horizontal diameter and then, after turning the kiln 90 deg., measuring the same diameter vertically. The Shelltest measurements, however, have proved that the ovality thus measured hardly can give a true picture of the real deformations during revolving. The greatest radius of curvature, and consequently the greatest stress on the inner side of the lining, will not arise in points of the shell section, where the tangent is horizontal, but just at the points where the supporting rollers touch the tire. The effect of pressure from the rollers will diminish with increasing distance from the rings. The figure which any point on the shell is describing will thus become more and more like that of a mathematical ellipse as the distance to the tire increases.

So as not to introduce a new concept, it is desirable to translate the results from the Shelltest measurements into the previously stated expression, "ovality." The ovality calculated from a Shelltest measurement corresponds to the difference between the great and the small axis in the presumed ellipse, which, when Shelltest is passing with the pins against this elliptic curve, will cause as great a difference between the largest and smallest deflection of the indicator as the one which is really achieved. Below will be deduced a relation between the differences in the deflections of the indicator and the ovality.

Ovality $\omega = 2\,(a\text{-}b)$;

The gauge, which is one meter, is supposed to be attached first to point A and then at point B. Maximal difference between the deflections of the indicator at these points is exposed by the equation, $\delta = h_1 - h_2$.

The equation for the ellipse is

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1;$$

The measuring pin being in point B the coordinates of the supporting points are $y_1 = L/2$;

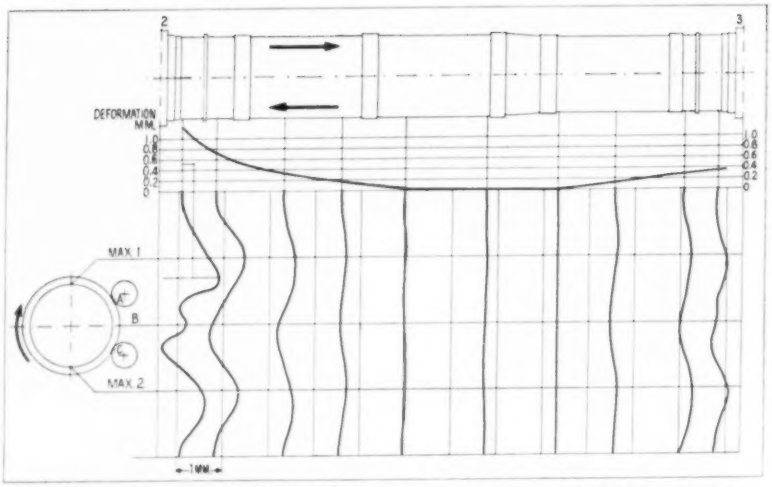


Fig. 6: Exact measurements of the deformations along a generatrix between two tires. The lower set of curves shows the course of deformation as revealed by the recorder. The maximal deformation is the difference between the greatest maximum value and the smallest minimum value. The curve in between shows the deformation between both tires

$$x_1 = \frac{a}{b}\sqrt{b^2 - (L/2)^2};$$

then

$$h_1 = a - x_1 = a - \frac{a}{b}\sqrt{b^2 - (L/2)^2};$$

Consequently,

$$h_2 = b - \frac{b}{a}\sqrt{a^2 - (L/2)^2};$$

$$\delta = h_1 - h_2 = a - b - \frac{a}{b}\sqrt{b^2 - (L/2)^2} + \frac{b}{a}\sqrt{a^2 - (L/2)^2};$$

The ellipse axis a and b can be expressed in ovality and diameter:

$\omega = 2(a-b)$;

$d = a + b$;

By eliminating a and b, a relation is obtained between ovality, ω, diameter of the kiln, d, and difference in deflections of the indicator, δ. By a series of developments the following relation may be deduced, if $(L/2)^2$ is neglected beside d^2.

$$\omega = \frac{4}{3} \cdot \frac{d^2}{L^2}\delta \cdot \sqrt{\frac{1}{1 + \frac{5}{12}\left(\frac{L}{d}\right)^2 + \frac{7}{24}\left(\frac{L}{d}\right)^4 + \frac{15}{64}\left(\frac{L}{d}\right)^6 + \ldots}};$$

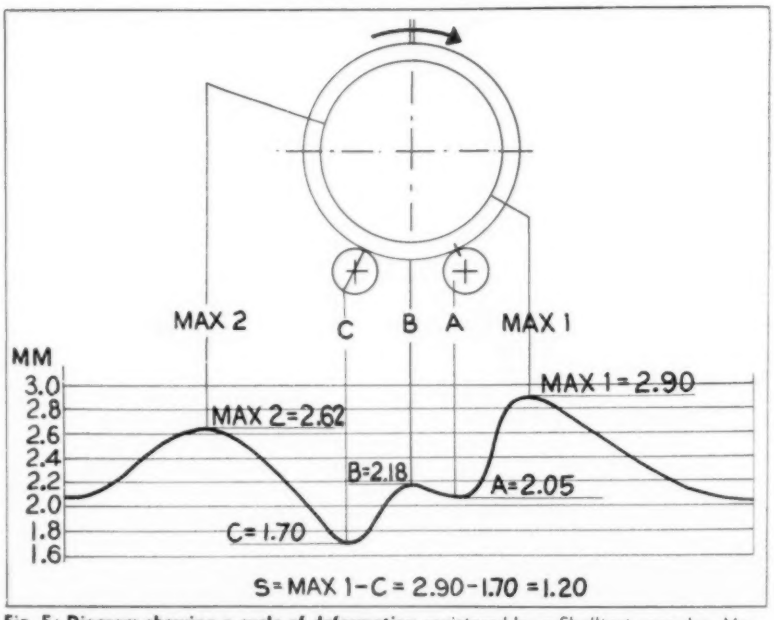


Fig. 5: Diagram showing a cycle of deformation registered by a Shelltest recorder. Max. 1 is near the supporting roller A, and Max. 2 is far off from the roller C, upon which the material in the kiln is mainly resting. Roller C carries a greater load than the roller A

Results from measurements of rotary kilns at different plants in several countries reveals how the deformations of the shell usually vary and to what extent the radial deformations influence the life of the linings.

Table 1 — Deformations of a Tire Construction with "Teeth" Between Shell and Tire

Diameter of the Kiln 3800 mm.

Tire number				1			
Distance from the Edge of the Tire	mm.				1500 above		
Generatrix		0	120	240	0	120	240
Max. Deformation	mm.	—	—	—	0.22	0.32	0.27
Calculated Ovality	mm.	—	—	—	4.1	6.0	5.1
Tire number				2			
Distance from the Edge of the Tire	mm.	1350 mm. below			1350 mm. above		
Generatrix		0	120	240	0	120	240
Max. Deformation	mm.	0.27	0.28	0.29	0.26	0.43	0.40
Calculated Ovality	mm.	5.1	5.3	5.5	4.9	8.1	7.5
Tire number				3			
Distance from the Edge of the Tire	mm.	1200 mm. below			1200 mm. above		
Generatrix		0	120	240	0	120	240
Max. Deformation	mm.	0.22	0.22	0.24	0.29	0.24	0.22
Calculated Ovality	mm.	4.1	4.1	4.5	5.5	4.5	4.1

As appears from equations (page 124), the calculated ovality varies linearly with the differences of the indicator, and the constant is depending on the relation d/L, or L being constantly one meter, only on the kiln diameter d. If the terms containing $(L/d)^2$ are neglected beside L, the following approximate relation is obtained for Shelltest (which has $L = 1$ meter):

$$\omega = \frac{4d}{3} \cdot \delta;$$

This relation may be used for rough estimations. For more exact calculations, it is better to use a more accurate diagram.

Measuring Procedure

Measuring the maximal deformation at a certain point of the rotary kiln shell is performed as follows. Shelltest is attached with the spring-loaded pin at the concerned point. Attachment is by means of an adjustable chain, which is easily drawn over the kiln by a magnet. When the pin of the gauge is placed at the actual point and the tension device is stretched, the gauge may follow the rotation of the kiln. The indicator has to be carefully studied when passing the lower arc of the revolution. Principally it should be sufficient to read the maximum and minimum deflections of the indicator, but experience has shown that it may be of interest to take some more readings. When the testing device is attached near a tire, the procedure is as follows:

At Max 1, Fig. 3, where the tangent to a section, perpendicular to the kiln axis, is vertical, the shell usually has a minimum radius of curvature; i.e., a maximum deflection of the indicator. The deflection decreases thereafter and reaches its minimum when the gauge is passing the line where the supporting rollers touch the tire; i.e., point A. If the supporting rollers are correctly adjusted, there will be between the two rollers a second minimum of the radius of curvature at point B, just between the two rollers, followed by another maximum of the radius of curvature; i.e., a minimum on the indicator, when the measuring point passes the touching point C between the tire and the second supporting roller. Finally there follows a section with a very small radius of curvature in the vicinity of the second point, Max 2, where the tangent to a section, perpendicular to the kiln axis, is vertical. When the gauge is describing the upper arc, there is a third maximum in the radius of curvature, representing a minimum in the indicator deflection. This is generally not so deep as at the points A and C and thus of no practical significance.

Measuring with Recorder

It may at times be difficult to observe the gauge in its different positions. This may in part be due to the fact that it is hard to observe Max 1 and Max 2 with the eye only, or it may be uncomfortable to watch the values A, B and C, if the space between the gratings and the kiln is too narrow. Further, the heat from the hot zone may be intolerable to the measuring team.

Consequently it would be desirable to record the deflections of the indicator in some way. For this purpose a new device, which can be added to the Shelltest gauge, has been invented. By means of this instrument it is possible to record on a diagram the deflections of the indicator during each part of the revolution. This unit can easily be attached to each existing Shelltest gauge, and will simplify and facilitate the handling of the gauge. At the same time it will certainly give a more accurate picture of the course than many notes of the indicator deflections indicator.

By means of this recording device, Fig. 4, called Shelltest Recorder, it is possible to limit the manual work near the hot kiln by attaching the gauge at the actual points and fixing the paper roll on which the deformations are to be marked.

In Fig. 5 are shown the observations on the indicator and a diagram made by a Shelltest Recorder placed near a tire on a kiln of 3.6 m. diameter. The largest deflection of the indicator is 2.90 mm. and the least one

(Continued on page 160)

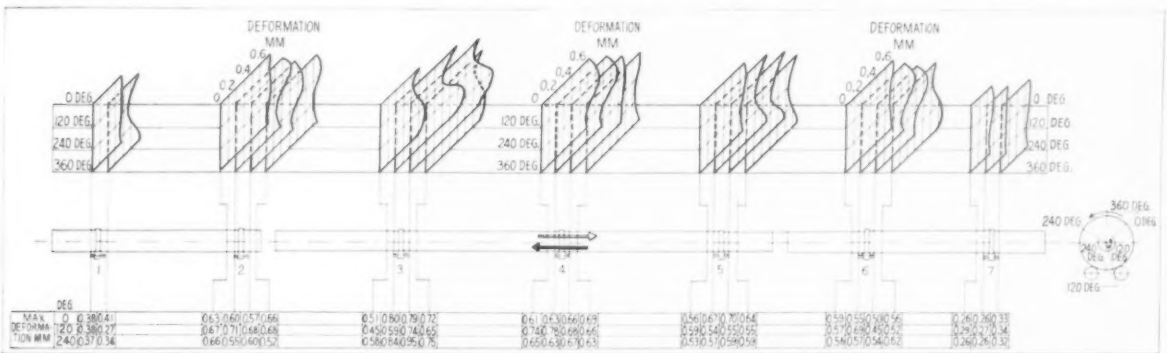


Fig. 7: An example of an accurate measurement of a rotary kiln with seven tires. The table indicates the stated maximal deformations along three generatrices. In the three-dimensional diagram, above, these deformations are drawn upwards on the extended kiln shell. The curves of deformation are calculated on the assumption of sinus-formed variations of the course of deformation in the same cross section. At the tire 3, the maximal deformations are observed at 240 to 270 deg., and the neighboring tires have minimal deformations in the same region; i.e., the axis of the kiln is curved at tire 3 in the mentioned angle

Three main operating segments of stone plant. No. 1, center, is the secondary crushing unit; No. 2, left, shows the ballast stacker belt conveyor; and No. 3, to the right, has a 42- x 30-in. rolls and two screens

Increase Crushing Capacity to 800 t.p.h.

• Eureka Stone Co., Eureka, Penn., completes big program of rebuilding, extending and modernizing facilities during the past two years. Also adds large bituminous plant

By WALTER B. LENHART

STARTING OPERATION in 1951 with a modest amount of equipment in a stationary plant, Eureka Stone Co., Eureka, Penn., has rebuilt, remodeled and added to its facilities in 1953 and 1954 until today it is one of the largest in eastern Pennsylvania with a capacity of 800 t.p.h. The plant is about 20 miles north of Philadelphia, with Norristown, Penn., about 15 miles to the southwest. A large urban and industrial area is served by the plant. The company's operation includes a large bituminous concrete plant as well as dry-batching equipment for transit mixed concrete. The crushed stone plant, of steel construction throughout, has most of the screens operating under cover, but the crushing units all operate in the open. Belt conveyors from 24 to 42 in. are used for all intraplant transportation, and some conveyors are greased for life. All material from the plant is delivered by trucks as no railroad serves it.

The Eureka Stone Co. is affiliated with the contracting business of James D. Morrissey, a contracting company which has large commitments in eastern Pennsylvania that include a sizeable section of the Turnpike work connecting the New Jersey Turnpike with Pennsylvania's, as well as other work in the area. The contract work uses a large portion of the plant's output, but stone is also sold commercially.

View of quarry showing shovel and tractor and crane equipped with drop ball, below, and above may be seen rotary drill

Quarry Operations

The stone being quarried is a hard blue, metamorphic, dolomitic limestone. Operations are in a quarry with a single working face of 65 to 80 ft. Overburden is removed by bulldozer, or cast back with a dragline well away from the rim of the quarry. A drilling contractor does the primary drilling on a contract basis using Joy rotary drills. The drill observed in service carries a 500 c.f.m. Joy compressor driven by a 6-cylinder General Motors diesel engine, which delivers air at 100 p.s.i. pressure. The primary source of power for the remainder of the unit is a 3-cylinder G.M.C.

diesel engine. The drill is mounted on crawler treads.

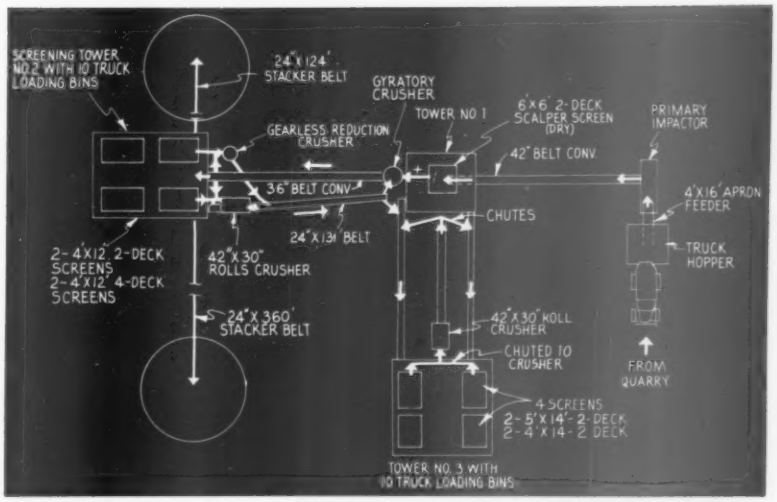
Three-coned 6¼-in. dia. rotary bits are used with hard surface nubs over the surface area of each cone. Three holes, about $\frac{5}{16}$ in. in diameter, direct the stream of compressed air from the drill column to the cone bearings. The stream of air cleans the roller bearings in the bit. The holes act as venturi, and allow sufficient air to reach the cutting edges to carry the cuttings away.

The Joy rotary used here drills at a rate of 20 to 30 f.p.h. The holes are up to 82-ft. deep and seven to eight holes are secured per bit.

Two 54-B Bucyrus-Erie shovels in the quarry load to a fleet of six Euclid rear-dump trucks. The quarry floor slopes slightly with the crushing and screening plant near the high edge. The floor is exceptionally clean and smooth and serves as a ramp for the fleet of trucks.

The plant, exclusive of the primary crusher, can be divided up into three segments: No. 1 contains the scalper and gyratory secondary crusher section; No. 2 is the tertiary crushing section consisting of a set of rolls and a gearless gyratory that receives a split feed from screens ahead of them; and No. 3 is the final screening section that includes the fourth size reduction via a set of rolls.

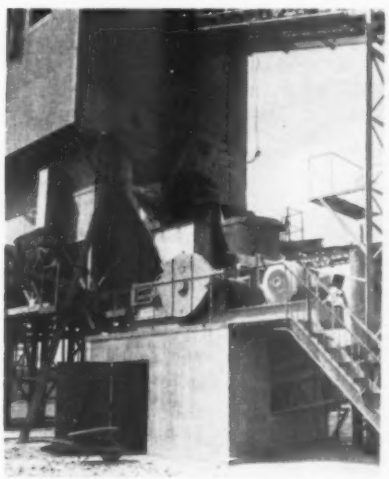
The earlier plant used a 50-50 Cedarapids primary impactor, two hammermills and a Kennedy-Van Saun gearless crusher along with adequate screening units. In the newer set-up, the gearless crusher is the only one retained. During the later changeovers, a 1260 Allis-Chalmers secondary crusher was installed replacing the hammermills. A set of 42- x 30-in. Cedarapids rolls were installed as a part of the tertiary crusher installation, and at this site the 37½ K.V.S. gearless crusher was retained. In the final screening and crushing section a set of 42- x 30-in. Universal rolls were also added. Many of the older crushing units, including the primary, were formerly driven by diesels, but now all crushers are electric motor driven. Additional belt conveyors were installed including two stacker belts. Universal, Cedarapids, and Hewitt-Robins conveyors are in the crushed stone plant. The vibrating screens are Robins, Cedarapids, Telsmith, and Aggregate Screen Co., Lancaster, Penn. There are nine vibrating screens in the plant.



Plan sketch showing the relative location of various crushing and screening stations

The older 50-50 impactor was replaced by a crushing unit of the same type but of heavier and more rugged construction. This unit was first designated as a Cedarapids 2500 but later the manufacturer re-named it to Model 5360H. The older unit was driven by diesels, but the new impactor is electric motor driven. The new primary has several important and different features. Many of the ideas that were incorporated in the new machine were conceived by the men who operated the previous crusher. Some of the more important changes in the unit are: the machine was raised about 5 ft. and the outfall to the 42-in. offbearing belt was re-designed. The side plates are cast steel and are 3 in. thick. The liner plates are of 1½- to 2-in. manganese steel. The sides are made up into three steel castings bolted together. The main bearings have been taken off the housing and mounted independently and are heavy-duty, antifriction, spherical SKF self-aligning units. Each impeller is now driven by a 250-hp. Allis-Chalmers motor. This is about 50-hp. (per motor) more than is normally recommended but these operators feel that the extra horsepower is better than taking any chances with interruptions in service. The impactor will take a rock up to 53 x 60-in. size and reduce it to minus 5- to 6-in. at 800 t.p.h.

(Continued on page 131)



Left: Roll crusher unit with gyratory alongside. **Center: Gyratory crusher** to the left of first scalper screen. **Right: A 42- x 30-in. final reduction roll crusher**

another Kennedy Giant

Goes to Construction

HIRAKUD

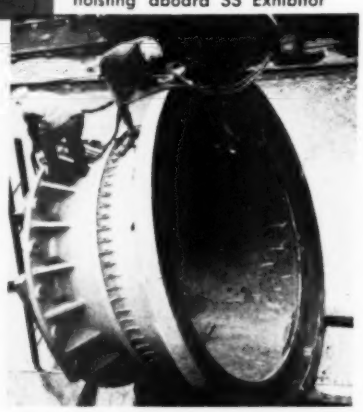
The second KVS Gearless Giant Gyratory Crusher has been shipped to India for use in the construction of the Hirakud Dam. When completed, this dam will form a reservoir covering an area of 600 million acre feet.

KVS machinery for cement manufacture, lime production, mining and crushing is in use throughout the World. KVS engineers are available for consultation *anywhere* to assist in solving construction problems.

We furnish anything from a crusher to a complete cement, lime crushing or mining plant. Before you specify . . . consult KVS and be *sure!*

62,800 lb. shell section of KVS Gyratory Crusher being hoisted aboard SS Exhibitor for shipment to India.

Riggers readying shell section of KVS Gyratory Crusher for hoisting aboard SS Exhibitor



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Gyratory Crusher

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DAM

More Tonnage At Lower Cost

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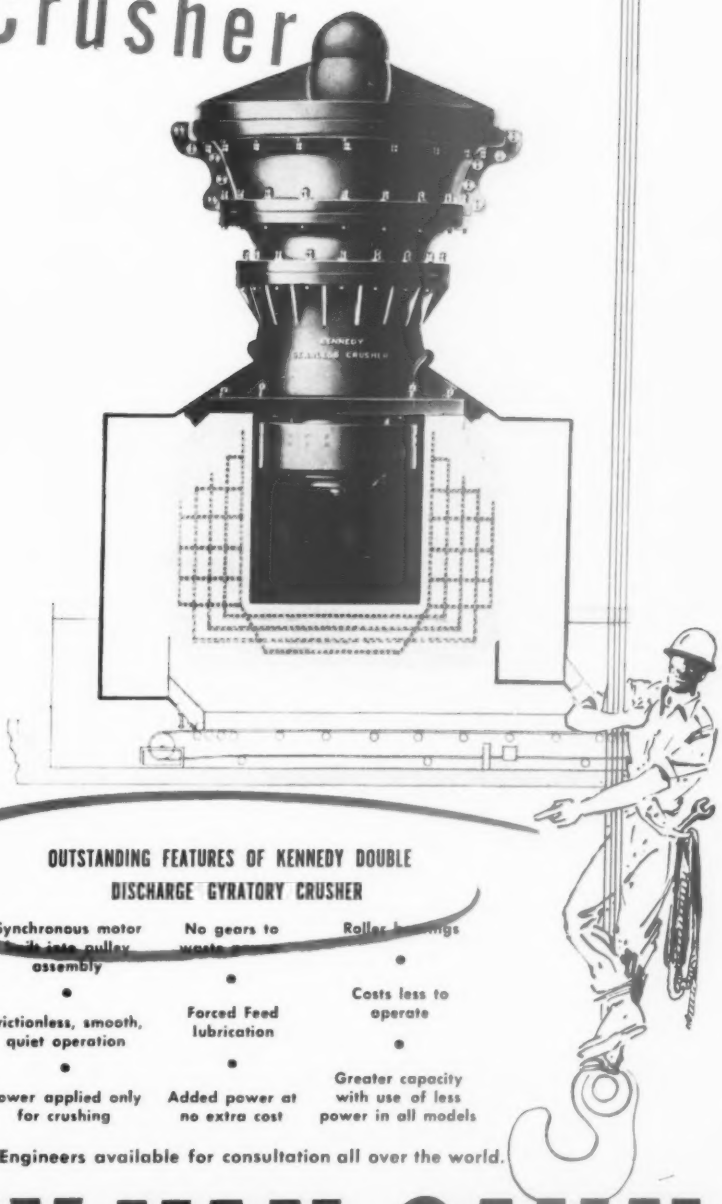
NEW KENNEDY GYRATORY CRUSHER



Greater production . . . more uniform sizing . . . in less time. That's the result with the new KENNEDY Gyratory Crushers. DOUBLE DISCHARGE outlets handle all types of rock containing as much as 50% clay *without sticking!* NO other crusher approaches this performance.

Lower operating cost . . . less maintenance and more crushing power per kilowatt! The synchronous motor is built into pulley assembly . . . power used only for crushing . . . no gears to wear! NOTHING performs like a KVS crusher but its duplicate. For peak capacities at lowest operating costs, KVS crushers have no equal.

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- Costs less to operate
- Power applied only for crushing
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At the quarry rim, the trucks dump to a 4- x 16-ft. apron feeder that serves the impactor. A 2-ton capacity Yale hoist is mounted on a steel frame over the apron feeder. Vertical chains hang in front of the feed opening of the impactor as a safety measure to prevent throwback. A dust collector was being installed at the primary crusher at the time of inspection.

No. 1 Screening-Crushing Section

Crushed material from the primary impactor falls to a 42-in. belt conveyor, which delivers the material to the first screening (re-crushing) segment of the plant. This consists of a 6- x 6-ft. Hewitt-Robins two-deck scalper screen, operated dry, with the plus rock falling to a 1260 Allis-Chalmers gyratory mounted on rubber cushions. Throughs from the gyratory fall to a 36-in. belt conveyor for delivery to screening tower No. 2 that includes the tertiary reduction crushers. The gyratory crusher replaces two hammermills formerly at this location.

Screening Tower No. 2

Screening tower No. 2 has two 4- x 12-ft. Hewitt-Robins four-deck vibrating screens followed by two 4- x 12-ft. Cedarapids screens, operated dry. Plus rock from these two parallel batteries of screens can go to either a 37½ K.V.S. gearless reduction crusher, or to a set of 42- x 30-in. Cedarapids rolls driven by a 125-hp. Reliance motor. The rock going to the screens is a split feed with each battery being fed by Syntron vibrating feeders. From these screens Pennsylvania No. 3 specification material is ground-stored via a new 24-in stacker belt which is 360 ft. long. Also, No. 4 (ballast) can be ground-stored via a new 24-in. stacker belt, 124-ft. centers.

Crushed rock from the second screening tower can be sent back to the Allis-Chalmers secondary crusher, should it become desirable or necessary to by-pass all or a part of the stone from the two tertiary crushers. Material not sent to the secondary crusher is diverted to a new 24-in. Universal belt conveyor, 131-ft. centers, with the stone being delivered to the third and final screening segment of the plant. The flow diagram gives the essentials of the general assembly.

Screening Tower No. 3

Crushed stone going to No. 3 screening tower first passes over a 5- x 14-ft. Telsmith three-deck vibrating screen with any plus rock being chuted to the newly installed set of 42- x 30-in. Universal rolls. Following the Telsmith screen is a 4- x 14-ft. two-deck Aggregate Screen Co. screen with a short belt conveyor between the two screens.

Primary impactor crusher driven by two 250-hp. electric motors. Truck dumping stone to crusher with hoist over apron feeder

The throughs from the Universal rolls are carried by a 24-in. Universal belt conveyor, 84-ft. centers, and can be returned, all or in part, to the 24-in. belt conveyor serving the first Telsmith screen. Or, the stream of stone can be sent (all or in part) to a second 24-in. Universal belt conveyor, 131-ft. centers, to a second set of two screens that are identical in size, number of deck and arrangement with those previously mentioned. Similarly, plus material from this section can be chuted to the 42-in. Universal rolls. Thus the rolls are in closed circuit with the two batteries of vibrating screens with a high degree of flexibility in the general arrangement. All material not stockpiled by the two previously mentioned stacker belts falls to L. B. Smith, Inc., bins below. Later addi-

(Continued on page 172)

Stacker belt conveyor for No. 3 Pennsylvania stone (cobble size). This is part of the section No. 2 in the plant

Truck dumping finished stone to bins ahead of bituminous plant

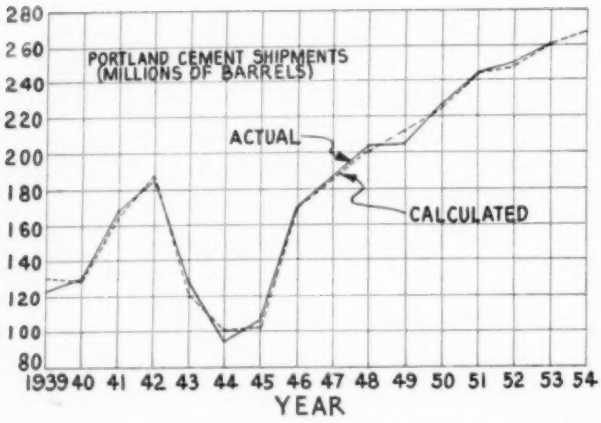

Chart 1: Portland cement shipments 1939-1953 and estimated 1954, actual and calculated

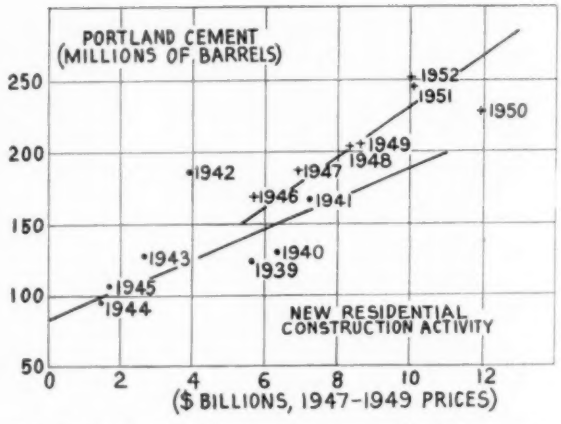

Chart 2: Portland cement shipments vs. new residential construction activity, 1939-1952

Estimating Demand for Cement

By NATHAN H. SCHEIN*

• Method of determining probable demands for cement is based on study of economic factors

CEMENT CONSUMPTION in 1954 should break the all-time record set in 1953, since an analysis of cement demand indicates that shipments this year should total about 268 million barrels. This 1954 estimate of cement demand compares with shipments of almost 261 million last year, representing an increase of 7 million barrels, and is based on an estimated $36 billion total of new construction to be put-in-place in 1954.

The analysis of cement demand further indicates that some 6 million barrels of cement will be consumed in new residential building; some 96 million barrels in new non-residential building; and about 163 million barrels in new non-building construction (highways, airfields, military construction, farm construction, conservation.) Other uses, including non-construction, will account for about 3 million barrels. These demand estimates include portland cement both as cement and as concrete products, — concrete masonry, precast and prestressed products, ready-mixed concrete, and other products.

Cement producers, in common with all other manufacturers, face the problem of constantly appraising market demand, both as regards present and future needs, and of bringing about necessary adjustments in production schedules, sales quotas and other activities within the control of the individual business.

In order to appraise market demands it is necessary to relate the individual company to the total business picture. Many companies have long-established methods for relating their sales to general economic factors affecting them — and conversely, for translating the implications of overall business trends into their own operations. In most cases, the firm compares the course of its sales or production with changes in certain business indexes which gauge the various broad economic factors most obviously influencing such sales.

Portland cement is a product which is used to produce other goods — one of the so-called "producers' durable goods" — so that the comparison of the firm's sales must obviously be made with the part of the economy in which cement is used; namely, construction. Since unlike some other important building materials, virtually all of the demand for portland cement comes from construction, it is possible to estimate its future demand (particularly the short term demand, i.e., one or two years) by relating cement shipments to construction activity.

Obviously, construction is not an entity but rather it is a composite of several differing types of activity insofar as the use of any given building material is concerned. Residential building is quite different, in material consumption, from industrial, commercial, or institutional building. Building construction of any kind is very different from non-building activity, — highways, airfields, dams, sewer and water works, etc.

For estimating purposes, therefore, it is necessary to relate cement consumption to significant major types of

TABLE 1: New Construction Activity ($ Billions, 1947-1949 Prices)

	Portland Cement Shipments (Millions of Barrels)	Total New Construction Activity	New Residential Construction Activity	New Nonresidential Construction Activity	All other New Construction Activity
1939	122.7	16.2	5.6	4.0	6.6
1940	130.3	16.9	6.3	3.5	7.1
1941	167.4	21.8	7.2	6.0	8.6
1942	185.3	22.9	3.9	7.2	11.8
1943	127.6	12.8	2.7	3.6	6.5
1944	94.3	8.2	1.5	2.9	3.8
1945	106.4	8.4	1.7	3.1	3.6
1946	169.3	15.5	5.7	5.0	4.8
1947	187.4	17.8	6.9	4.0	6.9
1948	204.3	20.8	8.3	4.7	7.8
1949	206.1	22.2	8.5	5.1	8.6
1950	227.8	26.9	11.9	5.9	9.1
1951	246.1	26.8	10.0	7.5	9.3
1952	251.4	27.3	9.9	7.4	10.0
1953	260.9	28.9	10.3	8.2	10.4
1954	267.7[2]	29.7[1]	10.4[1]	8.6[1]	10.7[1]

[1] Revised 1954 outlook in 1947-1949 prices
[2] Calculated from equation developed in text

*Building Materials & Construction Division, Business & Defense Services Administration, U.S. Department of Commerce

construction since aggregate demand is the sum of demands represented by the several construction activity components. While it is theoretically possible to relate cement consumption to a detailed breakdown of types of construction, earlier studies indicate that no significant increase in accuracy is thereby attained. For practical estimating needs, it is sufficient to relate cement shipments to three major groups, — new residential building activity, new nonresidential building activity, and all other new construction activity.

Accordingly, an estimating equation has been derived based on the three most important demand factors: (1) new residential building activity, (2) new nonresidential work put-in-place, and (3) all other new construction activity, with the results shown in the accompanying chart. In deriving the "calculated" data, construction activity was measured in dollars of constant purchasing power (1947-49 prices.) By means of this equation, it is possible, with a large degree of accuracy, to "predict" or estimate cement shipments for the coming year, since annual estimates are made of the outlook for new construction activity. (See Chart 1)

In November of each year the Departments of Commerce and Labor prepare jointly an "Outlook for Construction" for the following year, (these estimates are revised in June of the current year for which the outlook is prepared.) Shortly after the issuance of the first report, it is possible to secure a "translation of the outlook in terms of 1947-1949 prices. With this information on hand it is possible to arrive quickly at an estimate of total industry cement shipments for the coming year.

The foregoing serves to illustrate the proposition that, in general, any particular firm's sales are dependent to a considerable degree on the course of broad external forces, and these can be measured by the basic over-all indicators of economic activity — in the case of cement, new construction activity.

The next step in this process of interpreting a particular firm's position in relation to the course of business conditions is for the individual company to relate its activity to that of its industry.[1] There are several ways in which this can be done.

It can be done very simply by plotting the ratio of the individual company's shipments to the total cement industry's shipments. Often a study of this ratio is very revealing. It indicates whether a firm has been losing or gaining position relative to its competitors.

These two steps — (1) the evaluation of the over-all factors influencing the shipments of a particular cement firm, and (2) the appraisal of its position relative to the cement industry as a whole, should provide the factual basis for making decisions with respect to the prospects for the individual cement company's markets.

1/ Since many cement firms are more interested in regional than national estimates, it is well to note that the same general method described above is suitable for the determination of regional demand (or perhaps even the demand in individual states.) Of course, estimates of construction activity for specific states or regions are subject to greater estimating error than are national estimates. State and regional construction activity estimates are available only through 1952. In addition to the absence of more current data there is the problem of conversion of regional data to a constant price basis.

An earlier unpublished analysis for the East North Central States (Michigan, Ohio, Indiana, Illinois, and Wisconsin) yielded estimates of 49,675,000 bbl. in 1952, and 53,172,000 bbl. in 1953. Actual consumption (measured by destination of shipments as reported by the Bureau of Mines) was 49,483,000 bbl. in 1952 and 53,136,000 bbl. in 1953. No regional estimate for 1954 has been made.

The relationships between cement shipments on the one hand, and new residential construction, nonresidential construction, and all other construction, on the other hand, follow two distinct patterns; one in the years preceding and including the war period and another in the years after the war. (See charts 2, 3, and 4.) This suggests that during the war years, when construction was held down and cement use was correspondingly low, new techniques and improvements in use were being developed. These new and improved uses apparently came into full fruition after the close of World War II when construction was freed from wartime restrictions.

This apparent shift over time suggests that in the long term analysis of cement demand two discrete periods are involved, each of which was subject to different influences. In the case of residential and nonresidential building, the relationships between cement and construction are linear in both periods although the slopes of the lines of relationship are different. In the case of the all other new construction the change from 1939-1945 to 1946-1952 is much more pronounced.

The gross regression of cement shipments on all other new construction indicates a fundamental change in the demand function from 1939-1945 to 1946-1952. In the earlier period the relationship between the two is linear, as it is with residential and nonresidential building. In the latter period, however, the relationship for the all other category is changed to a non-linear one. The nature of the gross regression suggests a logarithmic function as the most appropriate, and this has been used.

Since the demand for cement is

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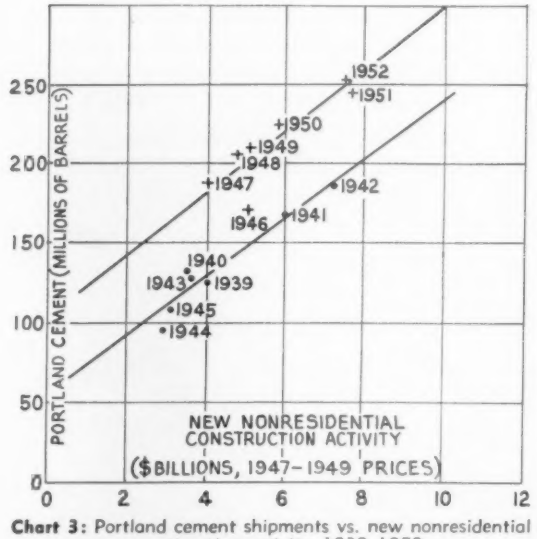

Chart 3: Portland cement shipments vs. new nonresidential construction activity, 1939-1952

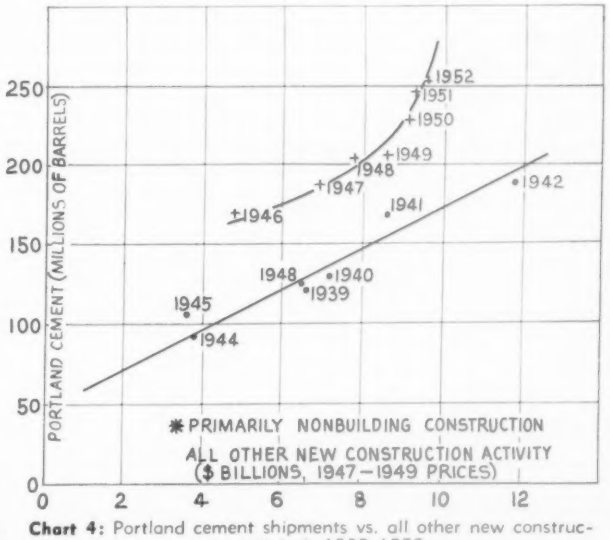

Chart 4: Portland cement shipments vs. all other new construction activity*, 1939-1952

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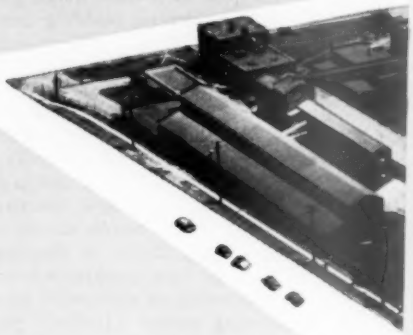
View of General Refractories' Baltimore Plant, devoted exclusively to the production of basic products, and (insert) battery of brick presses in Grefco Baltimore plant.



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Prospective Chemistry of Cement and Concrete

Part X: Recent research on the hydration products of Portand Cement

By NATHAN C. ROCKWOOD

ALL RESEARCHERS apparently agree that the constitution and structure of the hydration products of portland cement could not be established until the constitution of the unhydrated portland cement clinker itself was established. It is now safe to say, after a half century of portland cement research, that the experts are in agreement as to the constitution of the main constituents of portland cement. The only doubts appear to be as to the exact way in which the aluminum and iron oxides are combined with the calcium — and it is possible this may be different in different cements. So, one can now define portland cement as a complex aggregate of crystals and glass (amorphous material) composed of the oxides of calcium, silicon, aluminum, iron and the alkalies. There seems to be accumulating evidence, as we suggested much earlier in this series of articles, that the alumina or alumino-silicates in the raw materials are broken down in the kiln to single tetrahedra of silica (SiO_4) and alumina (AlO_4) and that these are joined or bonded together in three-dimensional lattices by the cations (positive ions) of Ca, Mg, Al, Na and K mainly through common anions of O (negative ions).

Just how these are bonded to each other is not yet known in detail, but when they react with water the concensus of expert opinion appears to be that the reaction is probably more or less individual, according to the special properties, or reactivity, of the individual oxide. Thus the alkali oxides, which are most readily and completely hydrolyzed or dissolved, are probably the first to react, with the calcium aluminates next, because the aluminum is either four or six coordinated with oxygen, and hence has a weaker structure than silica which is tightly four coordinated. The four coordination of aluminum with oxygen forms a weaker bond than in silica because it has a valency or bonding power of only three as compared with four for silicon — also aluminum is an appreciably larger ion than silicon, and hence the O packing is not as close or effective.

Much research is now being directed to establishing the nature of set and hardened portland cement, and the best literary approach for one who wishes to catch up on this recent progress is to study the Portland Cement Association's Bulletin 44, "The Reactions and Thermochemistry of Cement Hydration at Ordinary Temperature," by Harold H. Steinour. In this publication (a reprint of a paper at the Third International Symposium on the Chemistry of Cement, London, England, 1952) Mr. Steinour has reviewed in readily understandable language, the status of research studies up to that time. Considerable work has been done since then, to which we shall refer later on in this article, but some extracts and comments from Mr. Steinour's compilation are a necessary starting point. We shall not give his reasons for the opinions expressed; we merely hope to interest readers enough for them to seek these by reference to the paper itself.

The Calcium Silicates

The most logical approach to studying the hydration products of portland cement seems to be to study first the results of the hydration of its principal or most important constituents — the calcium silicates. It has been quite conclusively established that Ca $(OH)_2$ and SiO_2 gel combine in water to form hydrates of the monocalcium silicate ($CaO \cdot SiO_2$) type. In saturated lime water, such as one undoubtedly has in portland cement paste (or concrete) the molecular proportion of CaO held by the SiO_2 increases from 1:1 to 3:2, or even 2:1. How is any or all of this CaO bonded into the hydrated silicate? That point had not been finally determined. It could be either adsorbed on the surface (including the interior channels) of a two or three-dimensional silica lattice, or it could be in "solid solution." The latter term, as we have pointed out before in this series of articles, is an indefinite one so far as describing the nature of the chemical structure, or the bonds which hold it together are concerned; the distinction merely is that adsorption is considered to depend on a physical bond or attraction (surface) and solid solution on a chemical one, but there are many instances, as the reader of these articles must have seen, where it is difficult to distinguish between them except by an arbitrary definition.

Mr. Steinour quotes from a 1950 paper by H. F. W. Taylor, who was one of the earliest researchers to suggest the chemical structure of calcium silicate hydrate, based on studies of x-ray diffraction patterns, as a plate structure with variable spacing between the plates, filled with OH ions and/or water molecules, or quite similar to the clay minerals, which we have described previously. Such a structure, Mr. Steinour comments, could account for the varying percentages of CaO between the plates without resulting in fundamental change in the silicate structure. The Taylor x-ray patterns showed little difference regardless of the amount of lime (CaO to SiO_2 ratio) except that with the larger lime ratios or proportions the existence of free $Ca(OH)_2$ was evident. Mr. Steinour also discusses and summarizes the progress of research on the hydration products of the calcium-aluminum-and-iron-oxide complexes. We shall not refer to those here because we wish to continue about the more recent research on the calcium silicates, reported elsewhere since his paper was written.

The conclusions Mr. Steinour draws from his summary of the results of research to date are not dissimilar to those which we brazenly hazarded without any of his knowledge of the subject, but rather from an active imagination — perhaps too active as viewed by some of our more scientific friends! His conclusions, in part, read: "It can be said that little is definitely known. Much has been learned as to the *probable* products of cement hydration, but we can speak with finality on very few points. That calcium hydroxide is formed by the reaction of tricalcium silicate is, of course, definite. The other products, gel-like and evidently intimately intermingled, are not known with such certainty.

"The separate reactions of the individual clinker compounds are capable of accounting in large measure for

(Continued on page 140)

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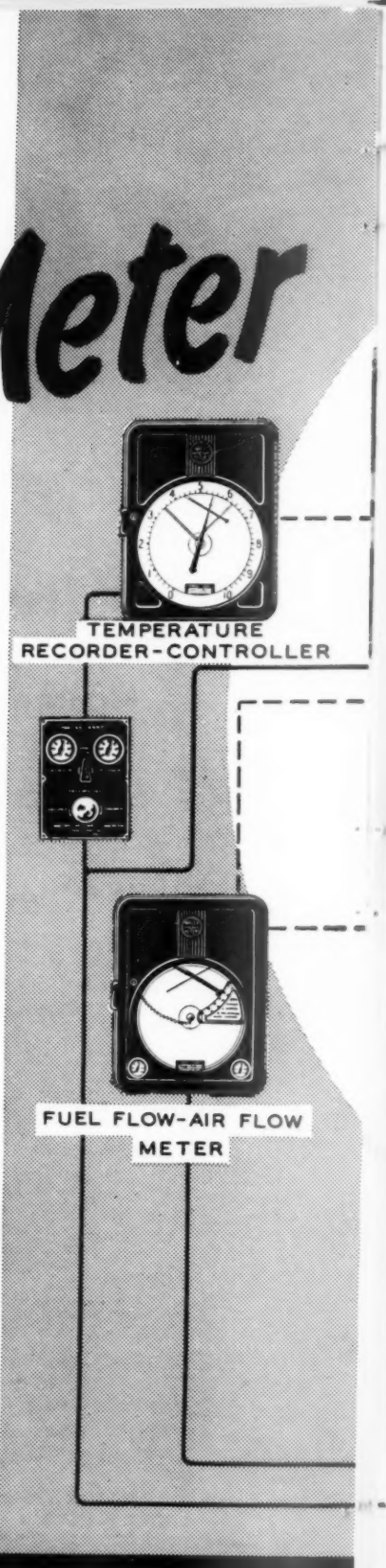

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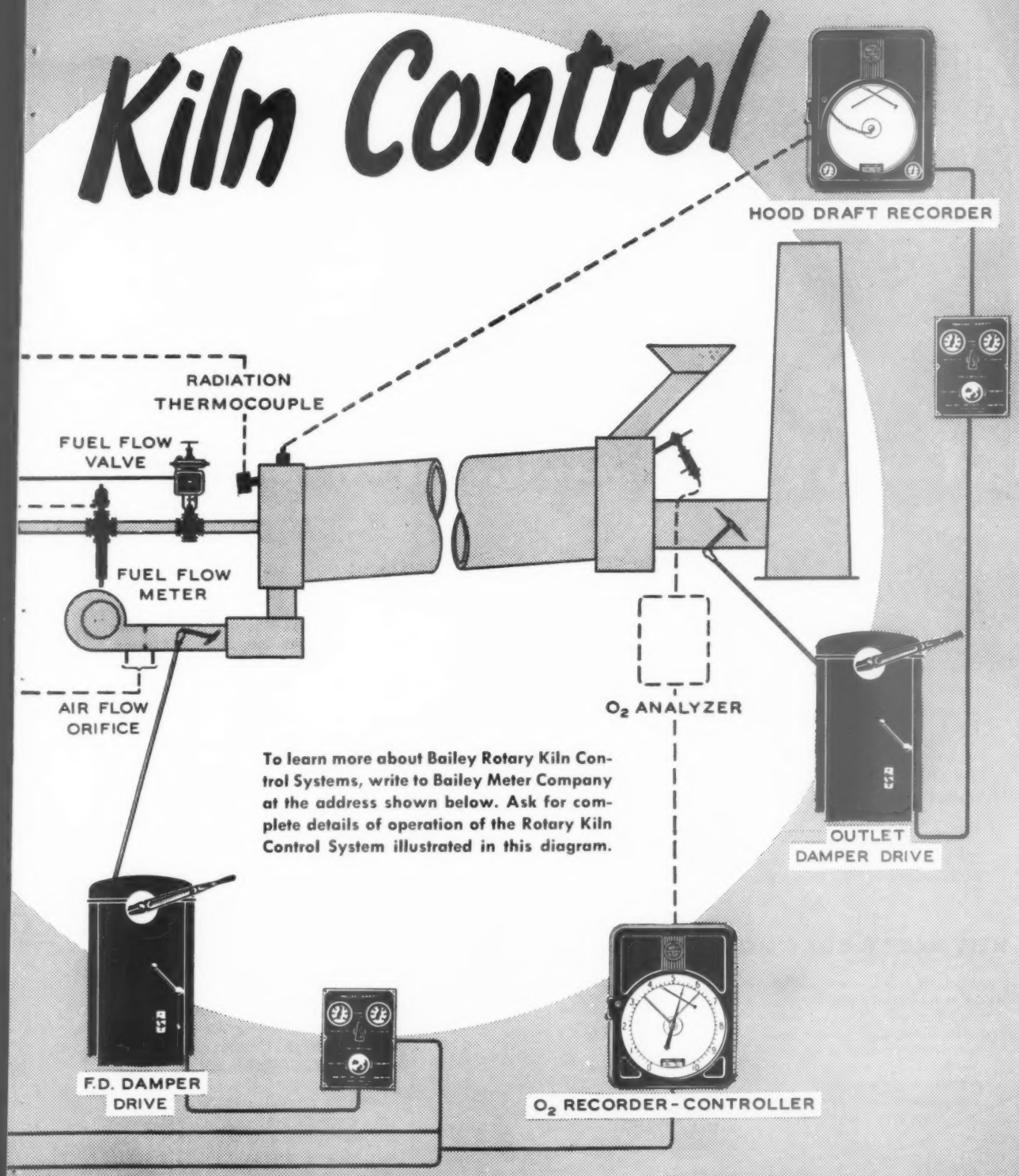
Kiln Control



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Cement Chemistry

(Continued from page 136)

the rates and ultimate values of the strength development and heat liberation of cement paste, but this does not rule out the possibility of some interaction. Indeed, one common gel may finally be formed. Even so, the nature of the combination may be more physical than chemical. We do not know." That is to acknowledge the problem won't be solved without more extensive recourse to physical chemistry — and the division line between physics and chemistry under the new sciences of collodial and structural chemistry is going to be difficult to establish. However, as we have endeavored to show in this series of articles, old style inorganic chemistry will no longer serve a useful purpose in understanding cement and concrete.

Mr. Steinour's concluding paragraph is as follows: "The calcium silicate (in the clinker) reacts with sufficient rapidity to saturate the solution quickly with calcium hydroxide. It continues to react, if not as rapidly as the aluminate yet at a considerable rate, evidently forming besides calcium hydroxide, a colloidal calcium silicate hydrate. The lime: silica ratio of this product may be 3:2, 2:1, or perhaps something less definite, for the product may be a solid solution, or it may hold considerable adsorbed lime. The dicalcium silicate reacts much less rapidly but apparently forms the same calcium silicate hydrate. Alkalies present in the cement may modify the calcium silicate hydrate by replacing a part of the lime with a lesser amount of alkali oxide. The silicate gel may not remain very distinct or independent (physically at least) from the other products, which also, are apparently largely colloidal."

Taylor's More Recent Work

The research on portland cement and synthetic calcium silicates by H. F. W. Taylor, et al.[5] was continued and is reported on in the *Magazine of Concrete Research*, October, 1952, published by the Cement and Concrete Association, of Great Britain. This is a progress report of a program of research on crystallographic and chemical aspects of cement hydration which has been going on since 1948. By way of preface it is stated that: "The study of the compounds formed at room temperature, which is the more directly important in relation to cement chemistry, is made difficult by the fact that they are gelatinous, ill-defined structures."

The alite of portland cement and a pure tricalcium silicate are much the

(Continued on page 144)

Pictures of the month . . . *by LeTourneau-Westinghouse*

Replaces 3 crawlers — One Tournatractor handles clean-up work formerly assigned to three 144 hp crawler-tractors at this open-pit iron mine. Unit serves 3 to 5 draglines and shovels, helping to keep ore production at 15,000 tons daily for owner. Material handled ranges from rock and limonite ore (weighing over 4,100 lbs per cu yd) to sand, clay, and gumbo. Big, rubber-tired machine also blades and cleans haul roads . . . dozes overburden . . . cuts ramps to loading areas . . . clears dragline roadway . . . hauls equipment . . . pushes trucks through soft going. After 3,000 hours work in abrasive materials, 21:00 x 25 tires still retain a substantial part of their original tread (see photo). Says Mine Superintendent, "Tournatractor can't be beat in open pit mining."

219 tons overburden hourly — Hauling clay, gravel, and sand overburden from a silica pit in Wedron, Illinois, each of these LeTourneau-Westinghouse Rear-Dumps completes seven 3600-ft cycles per 50-minute hour. Despite 400 ft of 6 to 10% grades leading out of pit and 150 lbs of rolling resistance on haul, the 3 units deliver combined total of 162 bank yds (219 tons) hourly. Says A. O. Anderson, foreman for Wedron Silica Co, Chicago owners of the equipment, "These Rear-Dumps are very easy on upkeep. To lubricate them takes less than 10 minutes a day." Says Operator Oliver Brooks, "They're easy to handle and maneuver."

. . . with performance reports from around the world

Licks swamp and sand — Sand and swamp hold no fears for Mike Stiriz of Patchogue, N.Y. His C Tournapull loads 14 bank yds of sand for building road over marshy land. Big tires provide plenty of flotation for travel through loose sand or muck. If one wheel starts to slip, differential automatically transfers its power to wheel on firmer footing, so unit rarely gets stuck.

Haul where trucks can't — When grades at their limestone pit near Ames, Iowa, got too steep for loaded 5-ton trucks, Ray Cook Construction Co drove in two 9-ton LeTourneau-Westinghouse rear-dumps. These units (with their high ratio of hp to wt) haul 9 yds of shale-clay overburden per load . . . complete 1250 ft cycles every 5½ minutes up same grades that stopped trucks.

Self-loads 9 yds — Traveling down 18% grade, C Tournapulls self-load 8½ to 9 bank yds of sandy loam overburden in 45 to 50 sec. Output for 3 "C's" on 3500 ft cycles is 288 to 324 bank yds per 50-min hour. Owners, Elgin-Butler Brick Co, Austin, Tex, also use Tournapulls for mining clay. Here, each "C" push-loads 12 yds; 3 "C's" move 432 yds hourly on 2100 ft cycles.

Handles 3 scattered assignments — One Tournatractor for Stewart & Nuss Inc, Fresno, California, regularly handles all dozing requirements of 3 plants (aggregate, asphalt, and sand) scattered in a 6-mile area. Getting 3 yds of crushed rock or sand per pass, it feeds hopper with 47 loads (141 cu yds, about 200 tons) hourly. Says Foreman John Hart, "In maintaining haul roads, Tournatractor does in 30 minutes what it would take a crawler a half-day to do." For information on any of these tools, write LeTourneau-Westinghouse Company, Peoria, Ill.

Learn operation in few hours — Tournapull Rear-Dumps haul, doze and compact up to 500 tons of coal a day in this stockpiling yard in Malajor, India. Calcutta Electrical Supply Corporation, Ltd is using 2 of these 9-ton units to eliminate hand-labor problems at their power station. Totally inexperienced operators learned how to use finger-tip controls within a few hours.

Tournapull—Trademark Reg. U.S. Pat. Off. Tournatractor—Trademark Pic-671-M

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same, although the chemical or crystal structures are slightly different because of small amounts of other constituents (Al and Mg). It is stated: "Substitution of this kind will alter slightly the calculated amounts of the various phases in portland cement clinker, but it seems to have no significant effect on the cementing properties. Tests carried on at the Building Research showed no significant differences between the strength curves of pure C_3S (tricalcium silicate, 3 CaO · SiO_2) and alite up to 28 days, provided 4 percent of gypsum was added in the latter case to prevent retardation of the reaction by a film of hydrated aluminate. In the absence of gypsum, the strength development was appreciably slower in the case of the alite than in that of the pure tricalcium silicate. Addition of gypsum had a negligible effect in the case of pure C_3S."

The report continues: "The pseudo-structure, common to all forms of tricalcium silicate, has been fully worked out during this investigation. The formula may be written $Ca_3O(SiO_4)$, i.e. the crystal is built from calcium, oxygen and SiO_4 ions. Each calcium ion is surrounded by six oxygens, arranged in such a way that the centers of five of them are in one hemisphere, with only one atom closing the gap on the other side. Large holes, equal in size and number to those occupied by the calcium ions occur adjacent to the loosely coordinated sides of the calcium ions. The oxygen ions attached to the silicon are each 3 coordinated on the other side by calcium ions, and those not attached to silicon are octhedrally coordinated by calcium." The authors do not provide a diagram to illustrate this structure, but the reader will probably be able to grasp the general idea if he will reread the description a few times.

Returning to his formula — $Ca_3O(SiO_4)$ — it will be seen that $Ca_3 = +6$ (positive) valences, and the O atom -2, the SiO_4 ion -4, so that in the combination the positive and negative valences are balanced, as they must be to maintain an entity. The 6—coordination is apparently of the same general character as in lime, but one SiO_4 takes the place of some of the O's in the lime structure, and causes a distortion of the ordinarily regular (cubic) structure of CaO. Dr. Taylor says that the Ca—O bonds are of length 2.34 to 2.54 Å (Angstrom units), the Si—O are 1.60 Å, and the minimum O—O distance 2.6 Å. It is thus apparent that the Ca—O bonds are not only weaker in general, but irregular in length and arrangement

*Prof. J. D. Bernal, J. W. Jeffery and H. F. W. Taylor.

as well. Alite differs from this structure because in every other cell two Si are replaced by two Al and one Mg (8 positive valences in each case).

Dr. Taylor says: "The alkaline character of C_3S, together with the high lattice energy associated with a distorted Ca coordination, and possibly also, the presence of 'holes' in the structure, give the compound a high solubility and reactivity towards water." This certainly means that the primary reaction of cement with water is *hydration of the lime* as such, as we suggested in Part III of this series (September 1952). In that article we referred to the theory of M. A. Bredig, as quoted by Dr. R. H. Bogue, that possibly the calcium was 8-coordinated in cement clinker, and the combination was unstable in water because the 8-coordination of calcium tended to invert to its normal 6-coordination, (in lime) and hence hydrate to $Ca(OH)_2$. Dr. Taylor now interprets his x-ray patterns to show that the calcium ion is 6-coordinated all the time, and owes its special reactivity to the peculiar spacing of the O ions about the Ca.

Dr. Taylor continues: "Solutions supersaturated with respect to the hydrates are therefore rapidly formed in the initial stages of the setting process, from which the hydration products crystallize out in the form of long needles or fibres probably only a few hundred Å thick. In the initial stage, therefore, it is unlikely that the anhydrous compounds serve as more than a source of calcium and silicate ions, from which the hydration products can be built. However, in the set paste, when very little water is present (relatively), it is conceivable that the details of the C_3S and β-C_2S structures may have more significance in determining the physical state, at least, of the hydration product. There is, however, no positive evidence for this speculation, and it is probable that the structure of the hydrate is the main key to the understanding and better control of all stages of the cementing process.

"It has been established by experiments carried out on aqueons suspensions," ($Ca(OH)_2$ and SiO_2 in H_2O), writes Dr. Taylor, "that two calcium silicate hydrates could be formed," which he designates (I) and (II), at room temperatures. "The former (I) has a composition varying between about CSH_1 and $C_3S_2H_3$ without change in x-ray patterns, apparently as a result of some form of solid solution. It is stable in contact with $Ca(OH)_2$ solutions at 20 deg. C. containing between 0.08 and 1.10 g. per l. of CaO. The hydrate (II) has so far been obtained only from C_3S, of which

(Continued on page 149)

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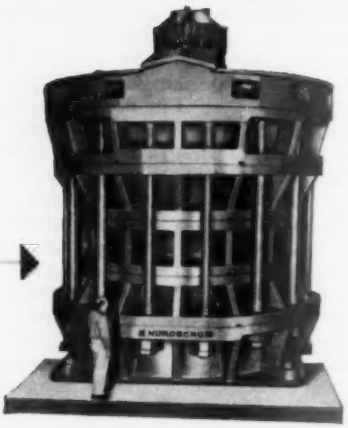

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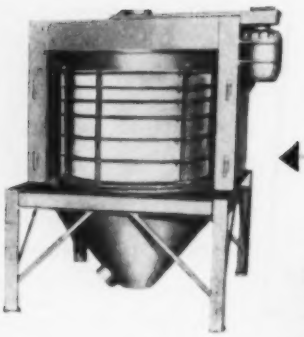

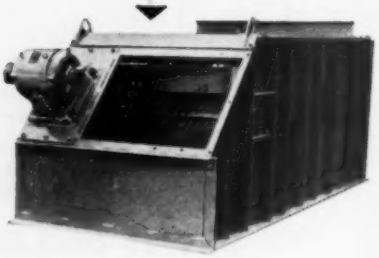

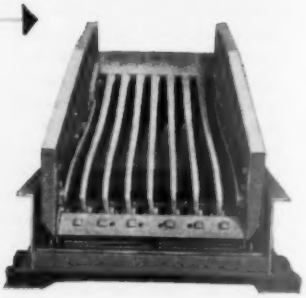

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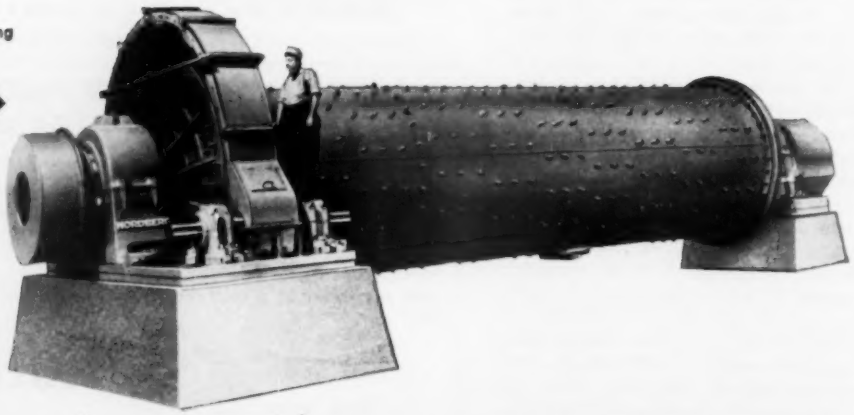

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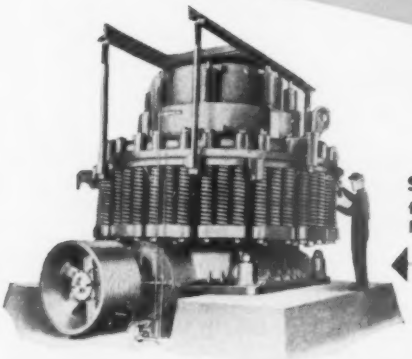

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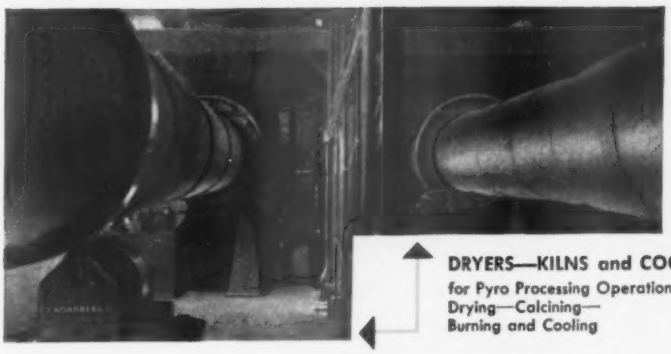

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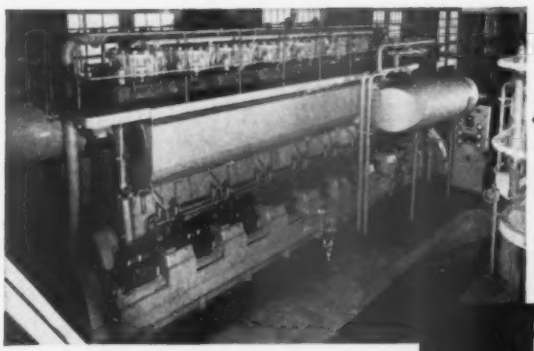

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Cement Chemistry

(Continued from page 145)

it is the first product of hydrolysis. It has the composition C_2SH_x, and the action of water on C_3S is to produce this compound together with $Ca(OH)_2$. Calcium silicate hydrate (II) is not stable in contact with aqueous $Ca(OH)_2$ (lime water) containing less than 1.10 g. per l. of CaO. Consequently if the concentration of CaO falls much below saturation (1.20 g. per l. at 20 deg. C.) the calcium silicate hydrate (II) is decomposed into calcium silicate hydrate (I) and $Ca(OH)_2$. Attempts to reverse this process have been unsuccessful; treatment of calcium silicate hydrate (I) with excess $Ca(OH)_2$ raises its lime:silica ratio to 3:2 but does not bring about any further reaction."

Dr. Taylor continues: "It therefore seems that the product most likely to be formed in hydrated cement will be one or the other of those compounds. Calcium silicate hydrate (II) might be considered the most probable of the two since excess $Ca(OH)_2$ is present. This is, however, by no means certain since, as Bessey pointed out, the solubility of the $Ca(OH)_2$ may be considerably depressed by the presence of alkalies, which are normally present in commercial cement."

A Very Important Point!

When he speaks of the "high solubility" of lime in water, it is difficult for this layman, at least, to visualize 1 — 1.20 g. of CaO per l. as a highly soluble compound. That is at most 1.2 g. per 1000 g. of water. One liter is equivalent to 0.264 gal. An ordinary cubic yard mix of concrete contains about 6 gal. of water. Hence a cubic yard of concrete mix contains about 22¾ liters, so 27.24 g. is the total amount of CaO in solution in a cubic yard of concrete at any one moment, i.e., about one ounce of CaO, for perhaps 470 lb. of cement. Since no more CaO can go into solution until some of this is crystallized out, or otherwise combined with silica (as a colloid, perhaps), it is hard to see how the theory of chemical solution, or hydrolysis of the CaO, can account in itself alone for the setting and hardening of portland cement. Moreover, these and other experiments show that the crystallization is a relatively slow process.

Dr. Taylor, himself, appears to recognize this difficulty for further along he writes: "It is noteworthy, that, whereas the development of strength of set C_3S pastes is three-quarters complete in 28 days the present results show that the chemical reaction is far from complete by the end of that period. This was observed in spite of the fact that

very finely divided C_3S was used (particle size less that 20μ). It appears, therefore, that only a small amount of hydrate is needed in order to cement together the grains of unchanged anhydrous compounds, and of the aggregate also, when this is present. Further reaction does not lead to any increase in strength and indeed could conceivably cause a decrease." It seems to us that this is a very important point because it emphasizes what both Steinour and Taylor mean when they say that the real character of the hydrate product may be more important from a physical than a chemical point of view.

Thus, if the grains of cement are merely bonded together with a film of calcium silicate hydrate hardly more than a molecule in thickness, it is important that the remainder of the cement particle itself be of a stable or durable character. Since a particle of anhydrous tricalcium silicate is admittedly very unstable in the presence of moisture, it would seem that it would make the worst kind of an aggregate. The dicalcium silicate particle is preferable because it hydrates much more slowly, and even after very long periods (many years) is only a little hydrated. If, as Dr. Taylor suggests, further hydration of C_2S not only does not increase the strength, but conceivably may decrease it, this is contrary to the whole theory upon which "improving" portland cement has been based by increasing the C_2S content, finer grinding, etc., to induce as complete hydration as soon as this can be achieved. Apparently the ideal cement would be a liquid or viscous calcium silicate hydrate, using just enough to provide an extremely thin coating of every aggregate particle, and then compressing the mixture until all the aggregate particles were in contact — a quart of such liquid perhaps serving the purpose of four or five bags of portland cement. That is probably an impossible attainment, but it should lead to a really durable concrete if the reasoning above is correct.

Dr. Taylor's conclusions, in part, are as follows: "Calcium silicate hydrates (I) and (II) possess layer structures in which the distance between the layers is dependent on the water content. The latter in turn can be varied by changing the temperature, or the vapor pressure over the substance. Calcium silicate hydrate (I) has been dehydrated at constant temperature and at constant pressure, and the results show that dehydration is reversible on heating to about 100 deg. C., or on drying over P_2O_5 at room temperatures, and accompanied by a change in the interlamella (interlayer) spacing. Further dehydration

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*U.S. Pat. No. 2373691, 2486421, 2525795, 2585943, 2595635, 2665074, Canada No. 439371, Mexico No. 44981, Argentina No. 60757, Brazil No. 32943.

and decrease of this spacing occur on more drastic treatment, but this apparently is not reversible. The fibre direction of calcium silicate hydrate (I) and (II) is contained in the plane of the layers. Consequently, changes in water content of these substances will affect the thickness, but not the length of the crystals (the fibres). It may be possible to account for the phenomena of shrinkage and moisture movement on the basis of these properties. The reduction in moisture movement brought about by steam curing or dry heating might be explained in part by the formation of the hydrate in a state in which subsequent alterations in water content occur to a smaller extent, or less rapidly than in normally cured cement. At the same time it can not be overlooked that shrinkage and moisture movement may be effects occurring on an inter- rather than an intra-crystalline scale."

S. A. Greenberg's Research

Sidney A. Greenberg, Johns-Manville Research Center, Manville, N. J., in the April 1954 issue of *The Journal of Physical Chemistry*, published by the American Chemical Society, has continued the studies of Dr. Taylor on calcium silicate hydrates. His experiments were with calcium hydroxide (analytical reagent grade) and hydrated silica, but his silicate hydrates were formed with large excess of water and at temperatures from 93 deg. C. up to 186 deg. His results tend to confirm Dr. Taylor's opinion that only two hydrates (I) and (II) are recognizable. These hydrates were studied with x-ray apparatus, thermobalance measurements (see the Rocky's Notes article in the May issue for description), by surface area measurements and by differential thermal analysis.

Conclusions

We trust that the reader of the foregoing extracts from the reports of experts engaged in cement research will appreciate our arguments that all of us who wish to understand cement and concrete must acquire some small amount of knowledge of structural chemistry. For, until we know how these particles or fibers of calcium silicate hydrate are held together, and bonded to aggregates, we shall never have the answer to concrete strength and durability. Moreover, the readers of these articles will know that real progress is being made that never could have been accomplished by sticking to the outdated concepts of inorganic chemistry of a generation ago.

•

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"Your PERMANENTE brick lining in this kiln has smashed all records here for service. The kiln came down after a run of 18 months, 8 days—topping the previous record by 2 months. This is 6 times the life we used to get with 70% alumina."

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Cement Demand

(Continued from page 133)

created by construction activity of various types, the general demand equation for both periods (1939-1945, and 1946-1952) can be expressed thus:

$x_1 = b_2x_2 + b_3x_3 + b_4x_4$ where

x_1 = estimated consumption (shipments) of cement in millions of barrels

x_2 = new residential construction activity in billions of dollars, 1947-1949 prices

x_3 = new nonresidential construction activity in billions of dollars, 1947-1949 prices

x_4 = all other new construction activity in billions of dollars, 1947-1949 prices.

Construction activity in constant prices is used so that the analysis is in comparable physical quantities. The estimating equations are derived by the least squares method, using the Doolittle method for the solution of the normal equations.

For the period from 1939 through 1945 the estimating equation derived is:

$x_1 = 49.03058 + 1.34068\ x_2 + 10.92365\ x_3 + 4.60529\ x_4$

The standard error of estimate after adjustment for 3 degrees of freedom is ± 7.55 million barrels. The maximum variation for the period 1939-1945 is 6.4 percent in 1939. The coefficient of multiple correlation is .936 with 96.7 percent of the variation in cement shipments explained by new residential, nonresidential, and all other new construction activity.

For the period from 1946-1952, the derived equation is:

$x_1 = 2.69190 + .53720\ x_2 + 11.18254\ x_3 + 159.04123 \log x_4$

The standard error of estimate after adjustment for 3 degrees is ± 4.0 million barrels. The coefficient of multiple correlation is .997 with 99.5 percent of the variation in cement shipments during this period explained by variations in construction activity. Maximum variation during this period was 3 percent in 1949.

Department of Commerce-Department of Labor estimates of construction activity (in 1947-1949 prices) for the years from 1939-1953 plus the outlook for 1954 are shown in Table 1. Substituting the 1953 values in the later period equation in the preceding section, 1953 cement shipments are estimated at 261.7 ± 4.0 million barrels. Shipments in 1953, as reported by the Bureau of Mines, totaled 260.9 million barrels. Thus the variation in 1953 was 0.3 percent.

On the basis of the revised 1954 outlook for construction activity in the United States, cement shipments (or consumption) will total 267.7 million barrels in 1954.

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WILFLEY'S remarkable success-record in solving a great variety of pumping problems is well known to operators of mills and chemical plants all over the world. It is a record born of engineering "know-how" plus many years of experience in keeping pace with the changing requirements of modern industry.

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Typical Wilfley installations are shown below. Rubber lining and stainless steel are some of the materials used in Wilfley Sand Pumps and Acid Pumps to provide maximum pumping efficiency.

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Exshaw Cement Plant

(Continued from page 122)

ondary air temperature, oxygen analyzer, kiln speed, gas flow and temperature recorder, and feed and discharge end draft. A radiation pyrometer with recorder is on hand for burning zone temperature. Cooler windbox pressure is indicated only.

Speed of the kiln is maintained constant unless there be major load fluctuations. A draft of 3.7-3.8 in. w.g. is being maintained at the back end to maintain a back-end temperature of 570-580 deg. F. Experience with natural gas as fuel has been excellent compared with the use of coal, mainly in the performance of refractories. There is little or no tendency, with gas, to burn off the protective coating on the lining, which occurrence was fairly frequent with coal. Firing rings are burned out by the simple adjustment of re-positioning the burner tip by moving it in or out horizontally.

Finish Grinding

Clinker from the three kilns is conveyed by 24-in. belt conveyors, with heat-resisting belting, and put through a 4-ft. Symons cone crusher from which it is conveyed by 24-in. belt conveyor to storage. One of the differences in this plant compared to the others of the company, is that clinker is stored in reinforced concrete silos. There are six 25-ft. inside diameter silos 68 ft. high arranged in a single row adjoining the new finish mill building. They are filled by means of a Jeffrey tripper overhead and overflow to ground storage outside. Capacity is 4200 bbl. each to the overflow level and 5250 bbl. if filled to the roof. Clinker from storage outside is readily returned into the silos by belt conveyors, using a bulldozer to move the clinker into a ground hopper nearby which is also used to receive gypsum in cars.

Gypsum from the track hopper is put through a 42- x 48-in. Jeffrey hammermill by a 40-in. reversible Jeffrey apron feeder. The crusher product is conveyed by a 24-in. belt conveyor to a transfer tower at the clinker conveyor from the clinker crusher to the clinker storage silos. When clinker is recovered from ground storage, the hammermill is by-passed and the clinker is transferred by the belt conveyor to the clinker storage belt conveyor.

Gypsum transfers to a second belt conveyor filling a 24-ft. 4-in. diameter by 42-ft. high storage silo from which it is drawn in proportioned amount for transfer over belt conveyor to the clinker belt delivering into the clinker storage silos. Thirty-inch apron feeders (2) below the silo driven by 7½-hp. Louis Allis Adjusto Spede drives are

adjusted by a Merrick motor-driven rate setter to maintain the desired rate of flow of gypsum on to the belt. Thus, the gypsum and clinker are proportioned in advance of storage and only one feeder is required for each grinding mill.

The clinker mill is completely new and housed in a new 85- x 185-ft. structure adjoining the six clinker silos for direct feed below. It replaces an old finish mill, consisting of eight Krupp preliminary mills and nine 5- x 22-ft. tube mills of which five were run in closed circuit with mechanical air separators and four in open circuit.

There are now five 9-ft. 6-in. by 18-ft. 5½-in. Smidth ball mills driven by 600-hp. G. E. synchronous motors through 11-ft. 7½-in. drive shafts. The mills each carry a charge of 52,000 lb. of 2½-in. and 34,000 lb. of 1¼-in. forged steel balls. They are fed by 52-in. diameter adjustable neck and scraper type table feeders delivering from the silos to 20-in. belt conveyors feeding into the mills. Operated in closed circuit with separate 16-ft. Sturtevant mechanical air separators, with a 200-225 percent circulating load, each mill is producing 91 bbl. of cement per hr. ground to a fineness of 1600 Wagner surface. Finished cement is pumped into the stockhouses by either a 7-in. or 9-in. Fuller-Kinyon cement pump, after first being put over a 4- x 10-ft. Dillon vibrating screen ahead of the pump hoppers. The finish mill has 10-ton Provincial cranes over the mills and the motors, and it is vented by three 85-360 Sly bag-type dust collectors.

Total cement storage is 370,000 bbl. in two large stockhouses, from which cement is reclaimed below by screw conveyors for elevation overhead to the packing machine bins or out the sides of the packing building for direct bulk loading into cars. Standard cement is packed by three model 111-FC 4-tube Bates packers and high early strength cement by a 3-tube packer. All shipments are by rail and approximately one-third in bulk.

K. E. Alexander is superintendent of the plant, W. E. Court is assistant superintendent, and D. H. Thomas is chemist.

Adds Asphalt Plant

Utah Sand and Gravel Co., Salt Lake City, Utah, recently added a $150,000 asphalt-mixing plant to its sand and gravel operations at Salt Lake City.

Stone Plant

L. G. Everist, Inc., Sioux Falls, S. D., recently announced the establishment of a new 400-t.p.h. stone plant at Rapid City, S. D.

Kiln Deformations

(Continued from page 125)

is 1.70 mm. The maximum difference is 1.20 mm. At an actual kiln diameter of 3.6 m., the corresponding ovality is calculated to 20 mm.

Reveals Mechanical Defects

The deformation gauge was originally constructed at Skånska Cementaktiebolaget, Sweden, in order to investigate a presumable relation between damages to the lining and the deformations. After some experimenting, it was obvious that the gauge is also a simple and practical instrument for detecting mechanical defects in general and particularly valuable for adjusting the supporting rollers.

The deformations of a rotary kiln shell vary considerably in different cross sections. Even within the same cross section there may be varying deformations. As a rule each point of the shell describes a cycle of deformation which is characteristic. In the following, information will be given about the normal variations of the deformations, partly axially and partly angularly within the same cross section.

Deformations are greatest at the tires and diminish with increasing distance from them. This is evident from Fig. 6, which shows a curve of the deformation variations along the longitudinal axis. Deformations in this kiln are none or practically negligible, in the zone between the tires. This is rather obvious as the deformations are mainly caused by the reaction forces which are transferred from the tires to the shell. It has sometimes been established that the deformations of old riveted kilns retain considerable values over the whole section.

Within the same cross section but on different angular points of the shell, the deformations ought to be of the same magnitude due to the symmetry of rotation. This is, however, not always the case, and fairly great variations do exist. Often the reason is that the axis of the kiln is not quite straight, and the varying deformations in this case may be explained by the fact that the force between the tires and the rollers, due to the curvature, varies with the torsional angle of the kiln. When the point of the shell passes the supporting rollers, where the distance between the shell and the turning center has its maximum, the pressure against the tire will, of course, be greater than when the diametrically opposite point passes the same rollers. As the deformations result from the pressure between the rollers and the tire, the deformations of a curved kiln ought to vary along the circumference in a curve, the form of which will

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California company reports INTERNATIONAL U-450 gasoline engine has power to crush bigger rocks than ever before possible.

The Goddard brothers of Hayward, California, don't worry about the size of rocks they dump in the hopper of their crushing plant, since they replaced an old engine with a new INTERNATIONAL U-450 power unit.

Owner John Goddard spells out the transformation this way: *"We're bustin' up those big rocks now. It's all because of our new engine—the INTERNATIONAL U-450. She's loaded with power and could easily double our current production of 500 tons daily if we could only get more rock."*

The U-450 is one of the seven new carbureted engines recently added to the INTERNATIONAL line which now includes 18 models—diesel, gasoline and gas—ranging from 16.5 to 200 net horsepower.

There's a size for every quarry or pit operation, and you can get expert assistance in cutting your power costs and stabilizing your production by seeing your INTERNATIONAL Industrial Distributor or Power Unit Dealer today. He'll give you the low-down on the dividends you can expect from INTERNATIONAL "Power that Pays."

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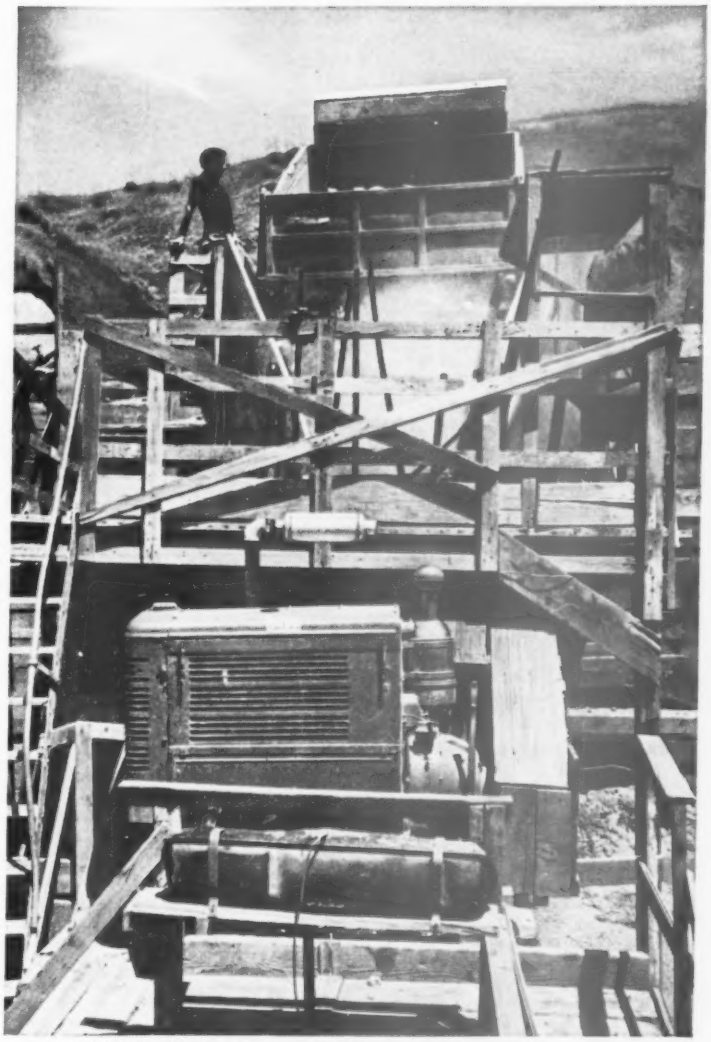

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coincide with that of a sine curve. In most cases this can also be verified. Other causes, such as rivet joints, welding of tires, and fractures in the reinforcement rings, have caused angular variations in the deformations.

Observations from a great number of measurements with the Shelltest have shown that there is some relation between the life of the linings and the deformations. Due to the complicated character of the lining problem, these relations are dependent on several circumstances and must be seen in view of other conditions that influence the life of the lining; such as, coating conditions, sintering properties, qualities of bricks, etc. Consequently kilns running without or practically without any coating ought to have the smallest deformations that may be possible. In spite of that, the damages to the lining in the hot zone have a certain tendency to occur in the vicinity of the tires; i.e., at the points with maximum deformation. In the case of a new kiln, the tires ought to be placed outside the hot zone, and if this is impossible, everything must be done to get as rigid construction as possible. To mention some figures, the deformations of kilns of 3 to 3.5 m. diameter, having bad coating conditions and the tires unsuitably placed, must not exceed 0.5 to 0.7 mm. This will correspond to a calculated ovality of 8 to 10 mm., which is a very serious claim upon the rigidity of the shell. If the thermical stresses are less; i.e., in the cooler parts of a kiln, or in kilns with good coating conditions, rather satisfactory lining conditions can be obtained if the deformations are greater, in the order of 1 to 1.5 mm., corresponding to an ovality of 20 to 25 mm. at the same diameter of the kiln. It seems, however, that rigid kilns retain the coating better, and therefore their linings should last longer than less rigid kilns. The tendency to construct new kilns with more rigid tires, observed all over the world during the recent years, thus can be said to be justified.

It has sometimes been said, that a kiln may not be too rigid owing to the risk of ring formation in or above the sinter zone, and apparently there is a reason for that. In one plant there were severe difficulties with the ring formation just above the sinter zone in a new kiln. In the other kilns of this plant such difficulties had not been discovered earlier in the same zones. It was found out that the critical zone in the new kiln was between two tires, while, on the other hand, the corresponding zones in the other kilns were just at a tire. After thorough investigation, it was proved that in the old kilns the same ring formation tenden-

(Continued on page 166)

INFORMATION

TO HELP YOU MEET TODAY'S PROBLEMS AND TO MAKE PLANS FOR TOMORROW

You can obtain catalogs listed on these pages by merely checking and mailing the coupon below

1 ARC WELDING — Air Reduction Sales Co. has published Catalog ADC 709B describing the features of the Heliwelding tungsten arc welding process and the equipment used with it. Actual welding operations are described and illustrated.

2 CENTRIFUGAL PUMPS—Worthington Corp. has announced Bulletin W-318-527 describing and illustrating type UNB two-stage centrifugal pumps. Dimension charts, a construction materials table, and a section drawing are included.

3 CLUTCHLESS DRIVE—Clark Equipment Co. has prepared an eight-page illustrated brochure describing the design, operation and maintenance of the clutchless Hydratork Drive. Close-up photographs of cutaway working units, and assembly and disassembly photographs are given.

4 COMPRESSOR VALVE—Pennsylvania Pump & Compressor Co. has issued Bulletin 509-C describing and illustrating the Airchek valve for air or gas compressors. Data is included on valve construction and maintenance.

5 CONCENTRATING TABLES—Denver Equipment Co. has published Bulletin T1-B3, describing Denver-Wilfley concentrating tables. Included are specifications, capacities, operation, application and construction details.

6 CONCRETE ADDITIVE—A. C. Horn Co., Inc. has prepared an eight-page booklet describing the properties of "Vibro-Foil," an expandable compound for mixing with cement grout, mortar and concrete to provide shrinkage control.

7 CONCRETE BLOCK CURING—Campion-Detroit, Inc. has issued a brochure describing and illustrating the Curolator saturation control unit for use in conjunction with a boiler in concrete block curing. A diagram illustrates a suggested continuous kiln layout.

8 CONCRETE BLOCK MACHINE—Lith-I-Bar Co. has prepared a folder describing and illustrating the Lith-I-Block machine. Machine components are also shown, and production advantages are discussed.

9 CONCRETE MASONRY—Marble Face Blocks, Inc. has released a brochure describing structural walls made with Marblox concrete masonry. Typical installations are shown in full-color photographs.

10 CONVEYOR—Gifford-Wood Co. has issued a bulletin illustrating and describing the Flowmaster "en masse" conveyor for free flowing materials. Included are dimensioned engineering drawings and an isometric cut-away section of a vertical run.

11 CRANE—Baldwin-Lima-Hamilton Corp., Construction Equipment Div., has announced literature, No. 73SC-B, describing the Lima Type 703-SC lifting crane, available on crawler, truck or wheel mount.

12 CRAWLER-SHOVEL—Osgood-General has announced specification literature, No. 5421, on the ¾-cu. yd. Model 250, combination shovel, dragline, clamshell, crane, hoe and pile-driver. Crawler dimensions, weights, working ranges, and lifting capacity charts are included.

13 CRUSHERS—The Jeffrey Manufacturing Co. has released Bulletin 864 on "Mud Hog" crushers for reducing wet, sticky materials. Included are specifications, diagrams, capacities, horsepower, etc.

14 CYCLONE THICKENER—Heyl & Patterson, Inc. has issued a folder describing and illustrating the "Jet-Injection" cyclone for thickening, classifying, clarifying and desliming operations. Test results and a performance curve are included.

15 DENSITY MEASURING UNIT—Sierra Industrial Instrument Co. has prepared a bulletin describing the "Densi-O-Meter," a density measuring instrument for slurries, solutions, oils, etc. A range diagram and a list of applications are included.

16 DIESEL—General Motors Corp., Detroit Diesel Engine Div., has announced the Spring issue of "Power Parade," a quarterly booklet describing the part diesel power plays in the world's economy today.

17 DOZER-SCRAPER EQUIPMENT—Hensley Equipment Co. has announced a catalog and price list, No. HC-54-A, on bulldozer and scraper equipment. Included are rippers, end bits, rollers, clearing units, brush rakes and miscellaneous replacement parts.

18 DRAGLINE BUCKET REPLACEMENT PARTS—Electric Steel Foundry Co. has issued catalog No. 108-K on replacement parts for any make or model dragline bucket. Data on how to determine proper drag chain length, specifications, maintenance tips and alloy recommendations are also included.

19 DRILL BLANKS—Hayden Twist Drill Co. has issued an "Industrial Users Net Price Schedule" for May, 1954, giving sizes and tolerances of high speed steel drill blanks.

20 DRYER-COOLER—Link-Belt Co. describes and illustrates the Roto-Louvre dryer-cooler in a 20-page brochure, No. 2511. Included are sections on the principles of drying and cooling; temperature and dust control; features, advantages and materials handled listing; laboratory and testing facilities; dimensions and typical layouts; and a psychrometric chart.

21 DUST CONTROL—Pangborn Corp. has issued Bulletin No. 1210, a 24-page condensed catalog on the entire line of blast cleaning and dust control equipment and accessories. Roto-blast, Airblast and Hydraulic methods of abrasive application are discussed, and illustrations and descriptions are given of the types of equipment which make use of the three principles.

22 ELECTRIC FORK TRUCK—The Yale & Towne Manufacturing Co., Yale Materials Handling Div., has brought out Bulletin 5001, describing and illustrating the Safety Silhouette electric fork truck. Dimensions, specifications and features are also included.

23 HARDSURFACING—Rankin Manufacturing Co. has brought out Form B-4 entitled "What Hardsurfacing Can Do for You," giving general information pertaining to Ranite hard surfacing materials.

24 INDUSTRIAL EQUIPMENT—Gardner-Denver Co. has announced Bulletin GP-100 covering the line of pumps, compressors, rock drills and pneumatic equipment used throughout construction, mining, petroleum and general industry.

25 INSTRUMENTATION INDEX—Minneapolis-Honeywell Regulator Co., Industrial Div., has issued an alphabetical index, No. 200-C, covering all issues of *Instrumentation* magazine published from 1943 through 1953. Part I lists the volumes and numbers, and indicates the issues which are out of print; Part II is an alphabetical index of articles, by subject; and Part III gives an alphabetical listing of the companies covered in the articles.

26 INSTRUMENTS — Minneapolis-Honeywell Regulator Co., Industrial Div., has issued Catalog 5001 containing brief descriptions of all Brown instruments, including pyrometers, potentiometers, temperature detectors, pressure gages, flow and liquid level meters, valves and diaphragm motors, and switches, starters, contactors and relays.

27 LOADING RAMPS—Penco Engineering Co. has released literature describing and illustrating magnesium ramps for car, truck and yard loading operations. Construction features are detailed and illustrated.

28 MOTOR STARTERS—The Electric Controller & Manufacturing Co. has released Booklet 1062 describing and illustrating motor starters having short circuit protection for 2200-5000 volt systems. Indoor and outdoor installations are shown.

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29 **PLUG VALVES**—Homestead Valve Manufacturing Co. has announced a 24-page reference book, No. 39-5, on lubricated plug valves in full-port and venturi types. Dimensions, lubricants and types of controls are given.

30 **PORTLAND CEMENT**—Calaveras Cement Co. has released a brochure entitled "There's a Calaveras Cement for Every Use," explaining specialty and five basic types of portland cement.

31 **PRESTRESSING**—Prestressing, Inc. has published a booklet entitled "The PI Method," describing post-tensioning of prestressed concrete with duplex-headed wire.

32 **PUMPS**—The Allen-Sherman-Hoff Pump Co. has issued catalog No. 953 describing and illustrating Hydroseal sand, slurry, and dredge pumps. Specifications, engineering drawings and performance data are given.

33 **REACTIVE CHEMICALS**—The Pacific Lumber Co. has brought out bulletin No. C-41-5 describing the commercial potentials of Palcotan and Palconate reactive chemicals. Listings of typical applications and general properties are given.

34 **RECORDERS-CONTROLLERS**—The Foxboro Co. has brought out Bulletin 407-1 describing and illustrating "Dew Point" recorders and controllers. Operating characteristics are described.

35 **RECORDING CONTROLLER**—General Electric Co. has announced a bulletin, No. GED-2100, describing and illustrating a recording controller featuring continuous standardization through the magnetic standard. Specifications and diagrammatical drawings are included.

36 **ROLL CRUSHERS**—Gruendler Crusher & Pulverizer Co. has issued a 12-page catalog, No. 702, describing and illustrating roll crushers. Construction features, capacity chart, specifications, installation data and line drawings are included.

37 **REINFORCING STEEL SERVICE**—Joseph T. Ryerson & Son, Inc. has released an eight-page bulletin describing its specialized reinforcing service for contractors. Services described include the drawing or setting of plans, fabrication or reinforcing bars and related products, tagging the steel according to setting plans, and timed deliveries based on progress of the job.

38 **SEPTIC TANKS**—Selvage Concrete Products Co. has brought out literature describing its septic tanks. Features, operation data and leaching trench details are given.

39 **SHOVEL-CRANE**—Link-Belt Speeder Corp. has issued a booklet, No. 2424, entitled "The Inside Story of Today's Most Advanced Shovel-Crane Control System." Operating and maintenance advantages of the LS-98, 1-cu. yd. shovel-crane, are given.

40 **SHOVEL-LOADER**—Baker-Lull Corp. has published a brochure describing and illustrating the Model 20 Shoveloader. Performance characteristics, specifications and a line drawing are included.

41 **SKIP HOISTS**—The C. O. Bartlett & Snow Co. has brought out Skip Hoist Bulletin No. 110 showing sequence views of weigh type and plug feed loading gates. Various size buckets are listed and travelling lifts, hoist engines, sheaves, head frames, counter-weights, etc. are described.

42 **SPEED VARIATORS**—General Electric Co. describes and illustrates a line of packaged speed variator drives from 1 to 200 hp. in Bulletin GEA-6127. Operation and application data are included.

43 **SPROCKETS-ROLLER CHAIN**—Dodge Manufacturing Corp. has brought out a condensed bulletin, No. A-632, supplementing the original bulletin, No. A-624, on Taper-Lock sprockets for sizes ranging from 20 through 160. Cross section drawings, dimensions, number of teeth, sprocket numbers, bushing numbers, etc. are included. Data is also given on Dodge roller chains, both riveted and cottered, and roller chain pin extractors.

44 **STOCK SPROCKETS**—Morse Chain Co. describes the line of Taper-Lock stock sprockets in Catalog C56-54. Packaged roller chains and chain links are listed, and bushing installation and removal instructions are given. Prices and sizes are listed for ½- through 2-in. pitch Type B sprockets, and for 1½- through 2-in. pitch Type C sprockets.

45 **TRACTOR-EXCAVATOR**—The Eimco Corp. has released Bulletin L1033 describing and illustrating the Eimco 105 tractor-excavator. Included are specifications, advantages and cutaway illustrations pointing out equipment details.

46 **TRACTOR-TRAILER DRIVES**—Stow Manufacturing Co. has released Bulletin 533 describing and illustrating flexible shafting, power take-off drives for tractor-trailer units. Installation data, specifications, and advantages are given.

47 **TRANSIT MIXERS**—The White Motor Co. has released a bulletin entitled "Facts That Will Increase Operating Efficiency in the Transportation of Ready-Mix Concrete," describing and illustrating various transit-mixer units, including the six-wheel Models WC 2264 and 302264.

48 **TWO-WAY RADIOS**—General Electric Co. has announced Bulletin ECR-152A describing the MC 2-W and MC 2-N radio communication sets. Specifications, illustrations and features are given.

49 **VERMICULITE**—Vermiculite Institute has released a bulletin entitled "Versatile Vermiculite in Modern Industry." Data is given on four sizes of vermiculite, and current uses in each category are listed. Sketches and photographs are included.

50 **VERMICULITE INSULATION**—Vermiculite Institute has issued a bulletin entitled Vermiculite Loose-Fill Building Insulation" describing its properties and giving installation procedures.

51 **VERMICULITE ROOF DECKS**—Vermiculite Institute has issued three technical folders: "Poured-In-Place Vermiculite Concrete Over Vented Steel Roof Decks," describing flexibility in joist spacing and slab thickness; and "Vermiculite Concrete Roof Decks Over Paper-Backed Wire Lath," the title of two folders covering steel or concrete joist construction where joist spacing does not exceed 32 in. on centers.

52 **VIBRATING CONVEYORS**—Hewitt-Robins, Inc. has issued a booklet, No. 135-A, describing and illustrating Rockermount and Springmount type conveyors. Typical installations are shown, and standard layout dimensions are given.

53 **VIBRATING SCREEN**—Pioneer Engineering Works, Inc. has brought out a 16-page bulletin, No. 651, describing and illustrating the Mesabi vibrating screen for severe service applications. Included are specifications, engineering drawings, and tables.

54 **VINYL COATINGS**—Mullins Non-Ferrous Steel Castings Corp., Carboline Co. Div., has prepared Bulletin 200 on Polyclad protective vinyl coatings. Five types are described, with primer requirements for various surfaces.

55 **WIRE ROPE**—Bergen Wire Rope Co. has released a folder describing the types of specified wire rope for various construction, contracting and industrial uses. Cross-sectional diagrams, recommended safety factors, and data on wire rope slings are given.

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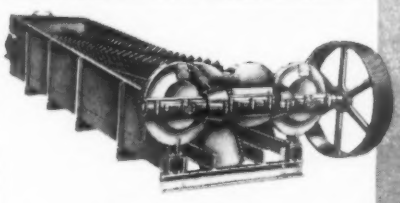
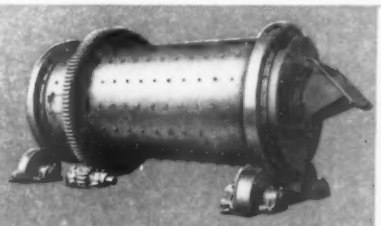
All Steel Rockmaster Single Roll Crusher for primary or secondary work on shovel loaded rock and ore.

A pioneer in the development of many types of processing equipment, McLanahan has served domestic and foreign pits, mines and quarries for more than a century. Shown on this page are a few illustrations of McLanahan equipment for crushing, washing, sizing and conveying all types of ore, coal and rock. Technical details and price information will be sent upon request.

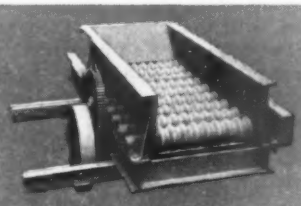


Log Washer for removing tough clay and soft rock from various materials.



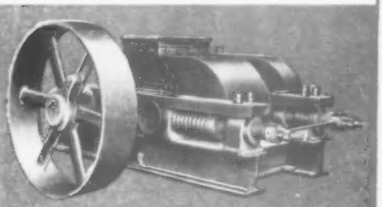
Steel Paddle Mill Scrubber—high capacity for cleaning large size feed.

Heavy Duty Reciprocating Plate Feeder. Handles any material from sand sizes to shovel loaded rock and ore.

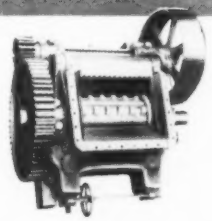


Live roll Grizzly for sizing and feeding various products.

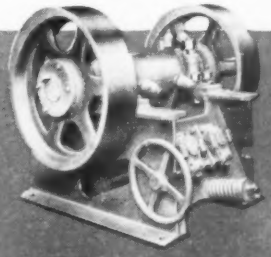
Double duty combination Scrubber and Sizing Screen for large and small capacities.



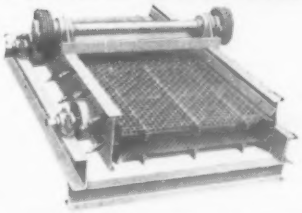
Heavy Duty Fabricated Black Diamond Double Roll Crusher for secondary reduction.



Automatic Steelstrut Crusher for primary and secondary work in small plants.



Fabricated Jaw Crusher for primary and secondary work.



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Kiln Deformations

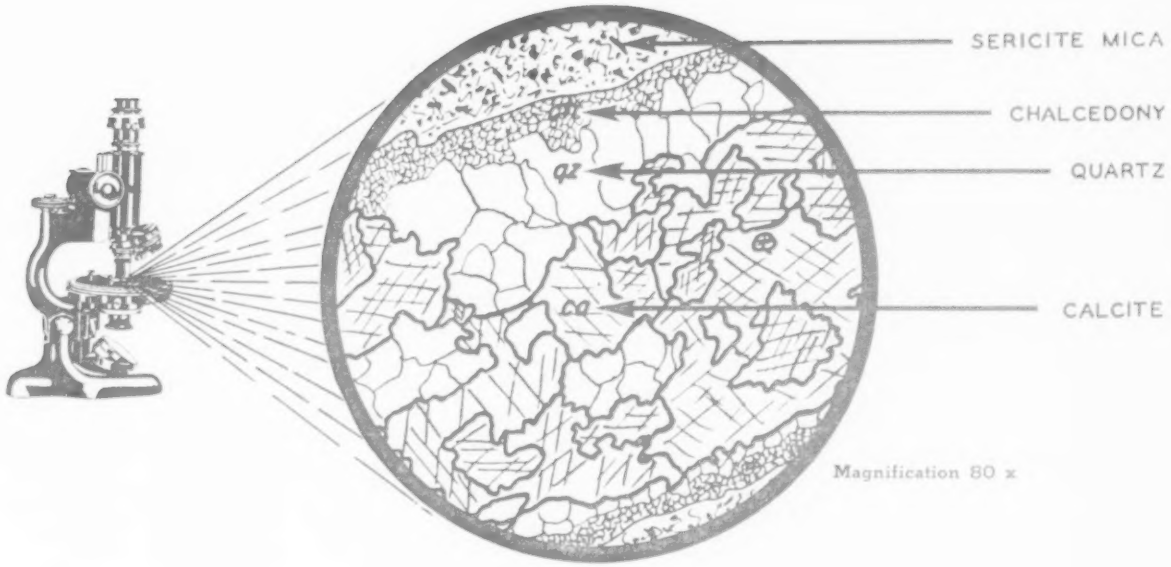
(Continued from page 162)

cy existed but due to the greater deformations in the area of the tires, they had no chance to grow into dangerous dimensions. With Shelltest, it was also determined that the deformations in the ring zone of the new kiln were very small or none. However, it may be doubted whether it is technically possible to avoid ring formation by means of a less rigid kiln. In the case in question, the ring problem was solved by the use of a more even flow of raw material.

As soon as methodical measurements of the deformations were carried out on some kilns, it was proved that Shelltest was an excellent means to control the adjustment of the supporting rollers. Rollers ought to be so adjusted that the maximal deformations at the different tires are equivalent. When the kiln is stopped, this easily can be controlled by sighting, but the method is not reliable and can only be used when the kiln is stopped and quite cold. Besides, this "aiming method" does not reveal eventual faulty lateral adjustment of the rollers. On the contrary, it may happen that after such an adjustment, the kiln is only resting on one of the rollers of the pair in question. Under such circumstances, unnecessarily large spot loads will occur, which cause much greater deformations than should have been the case if the pressure had been equally divided upon the two supporting rollers. Only after a thorough measuring of the deformations at the different piers is it possible to survey eventually necessary adjustments of the rollers.

It already has been said that the deformations may vary within the same vertical section. For each such section, more than one measuring point ought to be chosen, and suitably three at an angle of 120 deg. from each other. To get a clear survey of the measurement, it is most appropriate if these chosen measuring points in the different vertical sections are placed along the same three generatrices of the shell. This is exemplified in Fig. 7, which shows careful measuring of the deformations of a newly started kiln. The deformations are about the same, 0.5 to 0.7 mm. at the piers 2 — 6. At pier 1, which is in the sinter zone, the deformations are less, owing to the fact that this tire is surrounded by amply dimensioned stiffening rings. The constructor's intention to get as rigid construction as possible has thus proved successful. The tire 7 is dimensioned to support the load of an elutriation sludge preheater, which had not yet been installed. When this has been done, the defor-

Have you ever examined your cement raw materials under a microscope?



Your $CaCo_3$ may be too low.

Your Al_2O_3 may be too high.

Your SiO_2 may be too high.

Are your raw materials in proper balance for the manufacture of all types of cement?

Are your "added materials" an important item of your operating costs?

If you have any of these problems, our Flotation Process may be the answer.

Our laboratory and pilot plant at Catasauqua are fully equipped to make complete investigations of your materials. Based upon these investigations, by our mining and chemical engineers, we design, equip and supervise the erection of complete cement raw-material processing plants. Write us for particulars. Preliminary examination made without any obligation to you.

RESULTS OF FLOTATION

Quarry costs are reduced by using "Run of Quarry" instead of "Selective Quarrying"

Beneficiation of low-grade stone lengthens the life of your quarry.

Elimination of purchasing high-grade limestone.

All types of cement can be manufactured from the same quality stone.

Low-grade limestone areas, near the market, heretofore not considered usable for cement manufacture, can now be utilized

The flotation rejects are often marketed as a by-product

In many instances, the saving in quarry operation alone, more than offsets the operating cost of flotation.

Patent rights outside North America controlled, test work undertaken, and equipment furnished by F. L. Smidth & Co., A/S Copenhagen.

S-10

SEPARATION PROCESS COMPANY
CATASAUQUA, PENNSYLVANIA

mations at tire 7 will probably reach the same values as those of the tires 2 — 6. As a general opinion, it can be said that this kiln was ideally adjusted at the time for the measurement. A certain curvation, however, can be observed in the center line at tire 3. At generatrice 2, all the deformations have here minimal values, indicating a minimum in the distance between the generatrice and the rotary center, which the kiln should have had if it had not been mechanically operated by the supporting rollers. Simultaneously with minimal values at tire 3, there will occur maximal values at the neighbouring rings 2 and 4, indicating that these at that moment take over a part of the load, which is normally carried by the tire 3. This curvation of the line of the axis may be neglected and can presumably not be observed by means of any other measuring method.

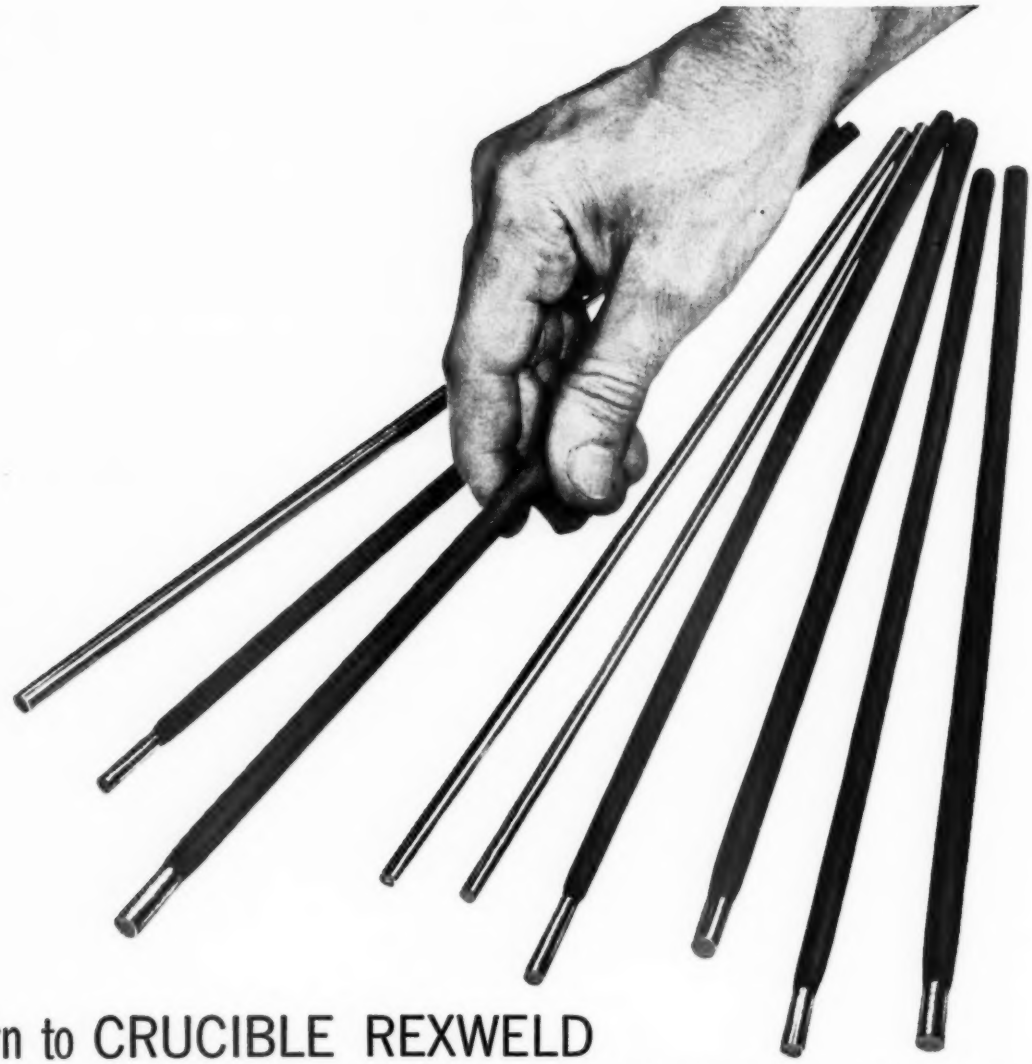
The axis of a kiln being moderately curved, it may be justified to lower the tire at the foundation where the deviation from the straight line has its maximum by increasing the distance between the supporting rollers. In this way, however, the load on the two neighbouring foundations is increased. The ideal state is when the maximal deformations at the three foundations are as great. It may therefore sometimes be simply faulty when the supporting rollers are so adjusted, that they are in an absolutely straight line.

Another indication of a curvation of the torsion axis of the kiln in a relaxed state is that the difference between the pressure on the supporting rollers at the same tire is subject to variations, when the kiln is revolving. This can be stated by a comparison of the deflections of the indicator at *A* and *C;* i.e., when the measuring point passes the touching points of the rollers and the tire.

Without a Shelltest, it is very difficult to get an opinion of the degree of curvation of a kiln axis in different points. By aiming or by means of optical instruments, it is hardly possible, because in spite of its large dimensions a kiln is rather less rigid relatively to its actual deviations. As a matter of fact, a kiln generally rests on all the rollers, but only after a measurement of the deformations with Shelltest is it possible to get an idea about the forces affecting the tires at the bearing points.

After careful measurements of the deformations at six or eight points in the vicinity of a tire, where the center of rotation does not coincide with that of the shell, it is possible to decide rather precisely the direction and to some extent the size of the deviation. Under such conditions, and if the tire

(Continued on page 171)



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is revolving-mounted in relation to the kiln, it will be possible during a kiln stop of considerable duration to adjust the curvation by exchanging the tire mounting blocks for others of different thickness in order to make the center of the tire coincide with the rotary center of the shell.

Tire Constructions

The most common principle involved in the transmission of forces between tire and shell is probably that the tire rests on the former-mentioned mounting blocks attached to the shell. These blocks also fix the tire axially. To allow for expansion, if a red spot should occur beneath the tire, the diameter of the shell with mounting blocks is somewhat less than the internal diameter of the tire, even at normal working temperatures. Consequently the tire moves a bit more slowly than the shell. The slip is generally 15-50 mm. per revolution. When the tires are worn, the slip can even be still greater.

During recent years, some new constructions have been announced, one of which has been described in *Zement-Kalk-Gips*, volume 6, 1953, No. 7. This tire construction is distinguished by "teeth" on the surface of the tire, which is turned to the shell, and these "teeth" gear into corresponding "clearings" fixed on the shell. Thereby a transmission of forces is attained from the tire to the shell which, contrary to the construction with a loose tire, has no tendency to deform the shell. Superficially observed, it seems as if the above mentioned construction could totally eliminate the deformations of the kiln. This is not, however, the case, as the forces between the tire and the supporting rollers cause radial deformations of the tire, which are transferred to the shell. This can be verified by Shelltest measurements made on such a kiln. The deformations as per Table 1 are indeed small, but fully measurable and approximately as great as those of a well-stiffened tire of common construction, Fig. 7, tire 1.

In conclusion it can be said about the two tire constructions that they equally allow for the expansion of the shell caused by eventual destruction of the lining under the tire. In the new design, the material of the tire will help efficiently to stiffen the shell and to diminish the deformations, which thus, to a great extent, will be depending on the dimensions of the tire itself. However, there is no constructional hindrance to stiffening a "loose" tire by means of suitable stiffening rings, etc. On the other hand, the new construction will give less deformations with the same quantity of material. Construction with a "loose"

tire will allow greater possibilities in compensating for an eventual curvation of the kiln by the use of mounting blocks of different thickness.

Summary

After a discussion of the mechanical stresses, to which a rotary kiln is normally subject, it is said that the radial forces and the deformations caused by them are most damaging to the lining. The deformations can be measured with the greatest accuracy with a special gauge "Shelltest," developed at Skånska Cementaktiebolaget, to which belongs an additional instrument automatically recording the variations of the radius of curvation of the running kiln shell.

Eureka Stone

(Continued from page 131)

tional stacker belts for ground storing of material may be installed.

Ground-stored material is reclaimed with three Bucyrus-Erie shovels and a Hough Payloader. A more recent addition is an SP-254W Lorain reclaiming shovel mounted on six rubber tires. The unit looks like a flat-rack truck bed with the Lorain shovel assembled at its front end. It swings a ¾-cu. yd. shovel. A single engine supplies power for the shovel section and for locomotion. The reclaimer is fast and has three speeds ahead and one in reverse, and in high gear on reasonably good roads can travel at about 25 m.p.h.

The hot mix plant was made by McCarter Iron Works, Inc., Norristown, Penn. Three bins, located below the general elevation of the plant, are loaded by rear-dump trucks. Material from these bins is reclaimed by belt conveyor for delivery to the bins of the black top plant. One bin unloads through a gravity-type gate. The other two feed the belt by means of small apron feeders. The apron feeders are driven by U. S. Syncrogear motors and Foote gear reduction units. The conveyor belt rides on Stearns idlers.

Transit-mixed concrete production is by two-stop dry batching operation. One scale is for the aggregates, the other for the portland cement. Bulk cement is handled with Butler bins and scales.

Two pair of Fairbanks Morse springless scales are provided for the trucks. The scale platforms are about 45 ft. long to accommodate semi-trailers.

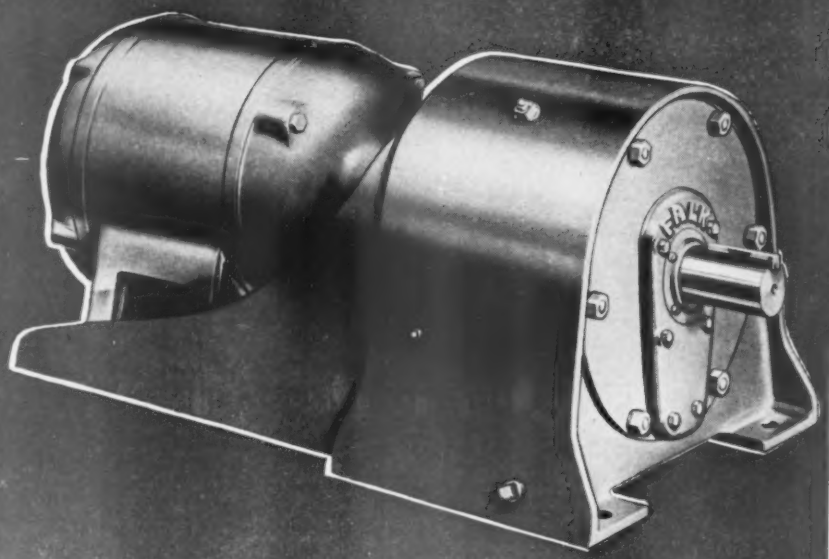
James D. Morrissey is owner of the Eureka Stone Co., and Charles Buonanni is superintendent.

Minerals Extraction Plant

NUCLEAR MAGNETIC Co., Port Orange, Fla., recently announced plans to build a $250,000 plant for extracting minerals from Volusia, Fla., beach sands.

Choose the All-Motor type,

ALL-STEEL FALK Motoreducer



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1 **All-steel Housings.** Unbreakable, strong, rigid. Generous overhung load capacities provided by wide bearing spans, large shafts and bearings.

2 **Streamlined inside and outside.** Smooth, clean surfaces; machine welded construction conforms to NEMA motor frames.

3 **Sealed Housings.** Dual closures and one-way vents keep oil *in*, dust and moisture *out*. Units are splashproof, leakproof, dustproof.

4 **Positive Lubrication.** Large sump capacity ...oil-tight construction assures clean lubricant...direct dip of revolving elements provides positive lubrication at all speeds.

5 **Wide Speed Range.** Selective ratio combinations provide output speeds from 1.5 rpm to 1430 rpm with stock gears.

6 **Precision Gearing.** Heat-treated alloy steel, precision cut and shaved helical gearing throughout...quiet-operating crown shaved pinions...taper bored gears for easy ratio changes.

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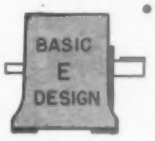

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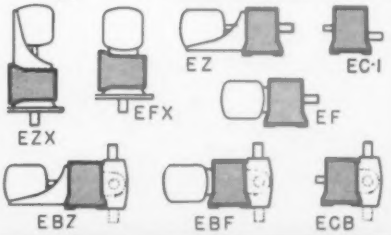
The basic E design permits maximum use of standardized parts . . . closer control over materials, processing, inspection and assembly . . . resulting in faster delivery from interchangeable stocked assemblies.



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The simplified construction of the FALK All-Motor type Motoreducer means real long-range economy. Motors or reducer units can be quickly and easily interchanged from one line or plant location to another. Fully standard replacement motors from manufacturers' field stocks are always available without costly delivery delays or special motor or shaft modifications.

When you choose a FALK All-Motor type Motoreducer, you get the utmost in design, versatility of performance, and utility—plus the greatest possible dollar-for-dollar value throughout its traditionally long life... Available in any standard ratio from factory and distributor stocks throughout the country. Write for Bulletin 3104.

FALK ...a good name in industry

THE FALK CORPORATION 3001 W. Canal St. Milwaukee 8, Wis.

Rocky's Notes

(Continued from page 69)

ern chemical concepts is that one must have also a knowledge of modern physics, because to explain electrons requires that they be conceived of not only as particles but as waves or vibrations, much as light has to be explained. Hence, when one gets into the subject of wave functions, mathematical concepts are required, and it is no place for the novice. Yet it is obvious that the day has gone when one can deal in generalities of chemistry and expect to solve any of the baffling problems presented, such as we are so familiar with in the literature of cement and concrete research. However, this text-book is not necessarily more difficult for the chemistry student who may be interested only in inorganic or mineral chemistry, because it covers a great deal of ground in organic chemistry. Here the nature of the bonding of atoms and molecules appears to be better known even if much more complicated, because this part of the field has been explored in greater detail than inorganic chemistry.

The fourth section of the book is on "The Metallic Bond," with subsections on electrons in a metal; alloys; mechanical properties. While this may not be a subject of special interest to our readers, it is an important part of the theory of chemical constitution, because in metals we have strong bonding of like atoms which can not be accounted for by the theory of ionic and valence bonding. Here again new theory is replacing not old but less recent theory. Our author states: "Formerly these metallic properties were attributed to the presence of free electrons. The classical theory of this electron gas (usually called cloud) leads, however, to absurdities." He explains further that: "Although the theory of metals, and thus that of the metallic bond, is essentially of wave-mechanical nature, a rough classical consideration nevertheless furnishes a good approximation for the total bonding energy from positive ions and electrons, i.e., of the lattice energy. In this the negative charge is thought of as uniformly distributed over space with the positive ions arranged in a regular lattice." The older or "classical" theory was that the metal atoms were held together by overlapping orbits of electrons (intermingled clouds of electrons).

The fifth section of the book is on Van der Waal bonding, divided into six subdivisions as follows: The three types of Van der Waal interaction; molecular compounds; cohesion energy and boiling point; miscibility and solubility; the melting point; the hy-

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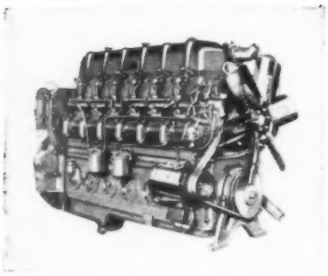
We can't sell you just one. We will sell you 30 to 255 "horses" at the lowest price you can buy diesel power: $16.32 a horsepower for the 6-cylinder model.

If you know diesel, you know there is nothing else like it. A diesel will take on any job you might give to a gasoline engine — and do it for one-third the cost. Not only that, it is simpler to maintain.

Buyers no longer ask *whether* diesel but *which* diesel. Which will deliver the most horsepower for the money? The most horsepower per pound of weight? Which is the easiest to service?

All three questions have one answer: *the P&H Diesel.*

P&H Diesel Engine Division, Harnischfeger Corporation, Crystal Lake, Ill.



Horsepowers, 30 to 255. Two-cycle, 2, 3, 4, 6-cylinder models. Speeds to 1800 rpm. Stationary, mobile, marine. Diesel-generator sets

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drogen bond. These bonding forces are more difficult to explain, yet conceivably they may be important in the bonding of hydrated cement particles and in the bonding of the cement particles to the aggregate. Our author says: "Van der Waal forces do not play a great part in the production of stable chemical compounds, but in the cohesion energy of solid and liquid phases, composed of separate molecules as units. This means that many physico-chemical properties such as volatility, solubility, miscibility, viscosity, plasticity and surface tension, which all depend on intermolecular interaction, and therefore on cohesion, are determined by the Van der Waal forces. This holds for most organic compounds and likewise for mixtures and also for many inorganic substances, among them water in the first place." From that we would hazard a guess that an investigation of the role of Van der Waal bonds in cement and concrete would be in order.

Obviously we have not attempted to make a critical review of this book. That would take a much better informed specialist on the subject than we could ever hope to be. What we have attempted here is to emphasize the importance of chemical bonding to any really fundamental research on cement, concrete and concrete aggregates, and to supply some small idea of what the subject comprises. Those who desire to do *original* research on cement and concrete should seek the services of recent graduates in chemistry and physics who can take hold where their older associates leave off.

Labor Relations

(Continued from page 71)

"This decision might be said to leave open the question of what, if anything, should be done with respect to the employe who obtained one of the posted jobs on the basis of his inadvertent misstatement on his employment record. But this issue is not before us. The only issue before us concerns the grievants, and the board of arbitration has determined only the rights of the grievants. It can go no farther. The grievances are denied."

Universal Atlas Case

The second case would seem trivial to the casual observer, but it did involve an important point in the right of management. It concerns the promotion of a laboratory assistant who had returned from military service at the Gary, Ind., plant of the Universal Atlas Cement Co. The union presenting the grievance was the local of the United Steel Workers of America, with which the employes of the Gary or Buffington plant are affiliated. The de-

(Continued on page 178)

One of approximately 1200 on the Minnesota Iron Ranges, this 34-ton "Euc" is loaded by a 5 cu. yd. shovel at a large open pit operation. Rear-Dump models are available with semi-rigid or spring mounted axles, Allison Torqmatic drives and transmissions, or conventional 5 and 10 speed transmissions.

More Profit with "Eucs" in Mines and Quarries

■ Built for tough off-the-highway service, Rear-Dump and Bottom-Dump "Eucs" and Euclid Scrapers are cutting the cost of moving ore and overburden, sand and gravel, and stone on quarry and mining operations. Big payload capacity, fast travel speed and high job availability add up to more loads per hour and lower cost per ton or yard hauled.

■ Your Euclid Distributor will provide a hauling production and cost estimate for your operation . . . there's no obligation so get in touch with him soon. Have him show you how Euclid equipment can improve your profit picture.

EUCLID DIVISION
GENERAL MOTORS CORPORATION
Cleveland 17, Ohio

This Bottom-Dump "Euc" is being loaded with 17 cu. yds. of sand and gravel from an overhead hopper for haul to the washing plant. Owner is Interstate Sand and Gravel of Covington, Ohio.

Ideal Cement Co. of Portland, Colorado uses 22-ton Rear-Dumps with quarry bodies to haul stone from the face to the crusher. Top speed of this Model 36 TD, with full payload, is 32.5 m.p.h. Spring mounted drive axle and Allison Torqmatic drive and transmission are important factors in stepping up production and profits at this quarry operation.

Euclid Twin-Power Scraper stripping overburden at a large gypsum quarry in Iowa. Powered by two 190 or 200 h.p. engines with torque converters and semi-automatic transmissions, this "Euc" self loads, has a struck capacity of 18 cu. yds. and travels up to 30 m.p.h. with full payload.

EUCLID THE PIONEER

Euclid Equipment

FOR MOVING EARTH, ROCK, COAL AND ORE

GM GENERAL MOTORS

cision was made by the single arbitrator.

The issue was stated as follows: "Under the provisions of Paragraph 8-B-5a of the agreement between the company and the union dated November 20, 1952, as amended, was the grievant entitled to be paid the training rate (Job Class 5) for the job of Technician rather than the standard rate (Job Class 4) for the job of Technician Assistant beginning May 4, 1953?"

The arbitrator reasoned in part as follows: "The grievant, returned from the service on May 4, 1953. The evidence is that on his return he was assigned to his old position as a Technician Assistant which he held before he left for the service. Personnel records and the payroll data show that he was assigned and paid at the Technician Assistant rate.

"A more important consideration, however, is that the evidence fails to show that the grievant was ever notified either prior to his resumption of active employment or subsequent to his return, and in the period preceding August 25, 1953, that he was promoted. The employe and the union were told by management upon each inquiry that the grievant was being 'considered' for a promotion to this job.

"The arbitrator is required to find from a preponderance of the evidence that the company took no action or made any statement which could be construed as a promotion of the grievant.

"The next question is whether the company, under the contract and the facts peculiar to this case, was required to promote the grievant. Under the plan in effect, movement from the job of Technician Assistant to Technician is not automatic. Each is a separate job class. The contract does not require that a vacancy be permanently filled within a specified period. In the absence of a specific contractual requirement, management has the sole discretion as to whether a vacancy should be filled. The evidence is that in this case it did not make such a determination and did not place its decision into effect until August 25, 1953.

"Most of the testimony at the hearing related to the question as to whether the grievant was required to perform the job functions of a Technician prior to the effective date of his promotion. Assuming arguendo, that the grievant was performing some of the job functions of a Technician during some of the time prior to August 25, 1953, this would not necessarily mean that the company was, therefore, required to permanently promote him to the position of Technician. In this

case, however, the evidence is that prior to August 25 he was not required to do the work of a Technician.

"The nature of the work performed under the descriptions relating to both job classes is similar. The factor as to whether the grievant worked in the front room or the back room is not controlling because the evidence shows that Technicians and Technician Assistants work at times in both rooms depending on the jobs coming through at the time. The controlling factors, under the contract and the job descriptions, are the degree of responsibility and the type of instruction, and as to each of these the arbitrator must find that the grievant was not in fact required to assume the duties of a Technician. The evidence is that prior to August 25, the grievant was not required to analyze test results or to direct anyone else as he is presently doing as an assigned Technician.

"The arbitrator must conclude that the evidence shows that the grievant had been absent in the military service for about two years and on his return management believed it needed a reasonable opportunity to observe his work and his ability to learn the new tests and methods prior to making a decision as to whether the promotion was to be awarded to him."

Arbitrator's Award — "Under the provisions of Paragraph 8-B-5a of the agreement between the company and the union dated November 20, 1952, as amended, the grievant was not entitled to be paid the training rate (Job Class 5) for the job of Technician rather than the standard rate (Job Class 4) for the job of Technician Assistant beginning May 4, 1953."

Sand and Gravel Shipments

CONSTRUCTION AGGREGATES CORP., Ferrysburg, Mich., reportedly has boosted Grand Haven, Mich., to the top position among all ports of the world in water shipment of sand and gravel. The city bases its leadership position on rocketing tonnage in recent years, which has reached the 3,000,000-ton mark.

Gravel Plant

BERNARD AND HENRY HAAK, Delavan, Wis., have opened a sand and gravel plant on County trunk M, just north of Delavan. Bernard Haak is head of the new company.

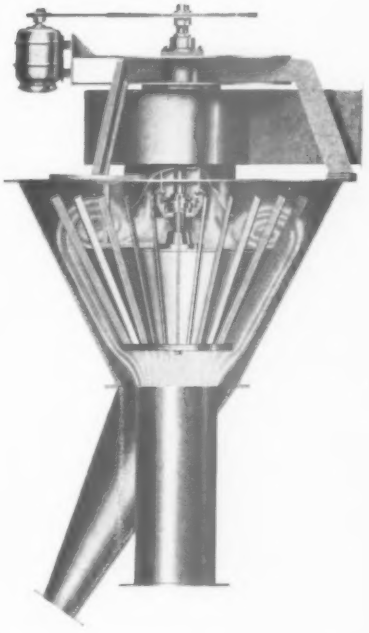
•

NOVA SCOTIA SAND AND GRAVEL, LTD., Halifax, N.S., has been incorporated to deal in gravel, sand, limestone, sandstone, building stone and other building materials. Capitalization consists of $40,000, divided into 4000 shares of $10 each. The incorporators are Lawrence F. Daley, Gordon S. Black and Phyllis E. Russell.

NEW HARDINGE "GYROTOR" CLASSIFIER PROVIDES CLOSE PRODUCT CONTROL

Hardinge Company, Incorporated, recently announced a completely new type of dry classifier—the "Gyrotor" Air Classifier, which has been designed for extremely close control of product in a dry grinding or separating operation. It can be used in closed circuit with a grinding mill or as a self-contained sizing unit for any moving stream of air-solids mixture.

The classifier is basically an inverted, truncated-cone shell with a motor-driven, bladed rotor of similar shape revolving on a vertical center axis inside the outer shell. The raw mixture of coarse and fine airborne material is fed in from the bottom of the cone, passes upward in the annular space occupied by the whirling blades, describes a doughnut-shaped motion above the rotor, and discharges through a central opening in the top. Oversize not removed by the impact of the blades drops out in the eddy current above the rotor and centrifugal action deposits it on the outer shell of the classifier, where it slides to the oversize discharge at the base of the shell. The returning oversize is definitely cleaned of fines due to the winnowing action of the rotor blades in the annular space.



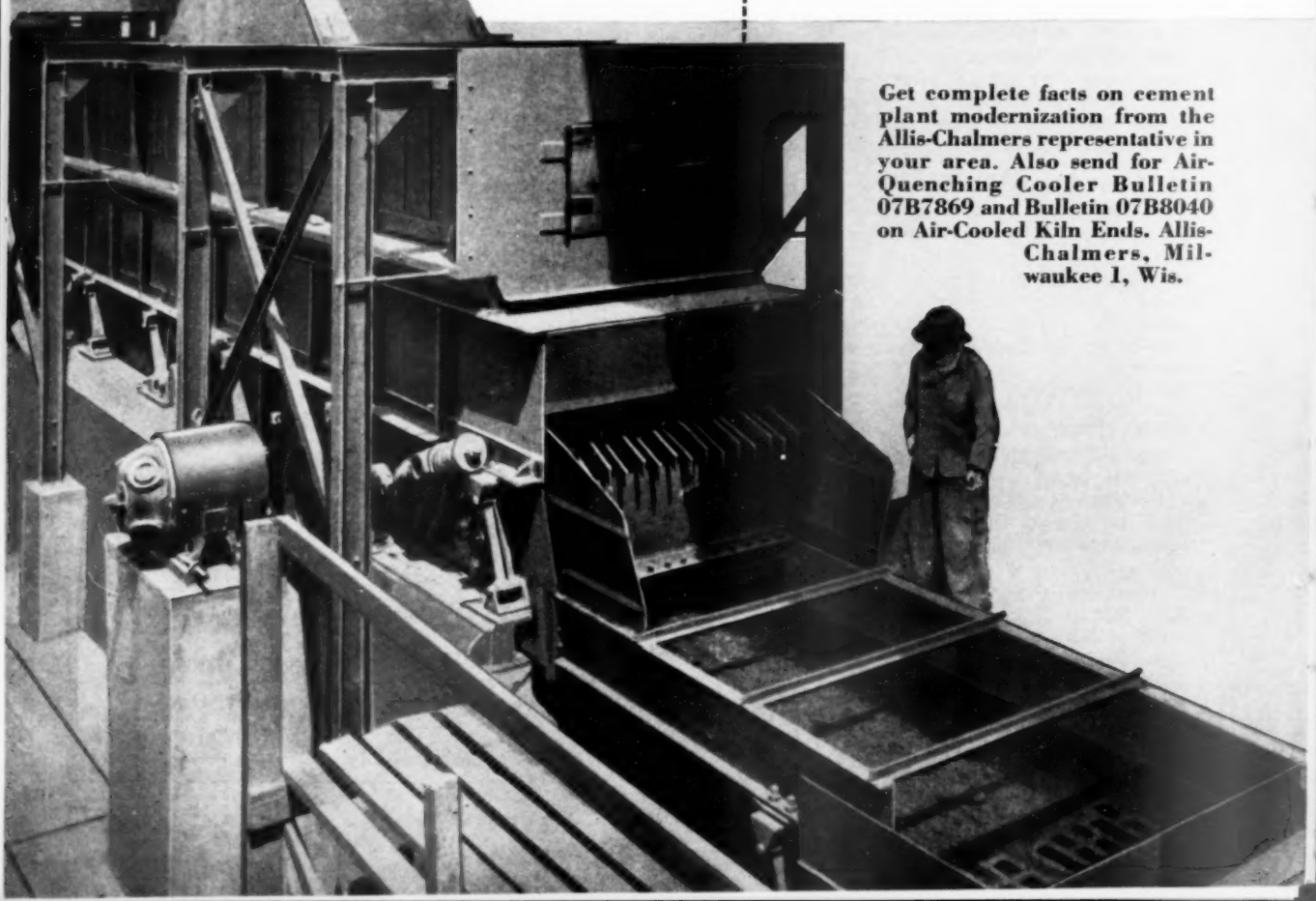
The classifier has a wide range of fineness control, and adjustment of product size is made simply by changing the rotor speed.

Hardinge Bulletin AH-449-7 describes this new classifier in detail.

...For More

1 INSTALL AN AIR-QUENCHING COOLER

You'll get greatly reduced rotary kiln fuel costs with an Air-Quenching cooler . . . and surprisingly low installation costs. Horizontal operation eliminates need for a deep pit under discharge end. Cooler arrives in two pre-assembled sections. Easy to install. Air-Quenching shaking grate coolers isolate and capture the hottest secondary air above the cooling clinker for return to the kiln. True air-quenching of clinker (cooled rapidly, not gradually) reduces grinding costs. Low power and maintenance costs.



Get complete facts on cement plant modernization from the Allis-Chalmers representative in your area. Also send for Air-Quenching Cooler Bulletin 07B7869 and Bulletin 07B8040 on Air-Cooled Kiln Ends. Allis-Chalmers, Milwaukee 1, Wis.

3 WAYS You Can Modernize Your Plant

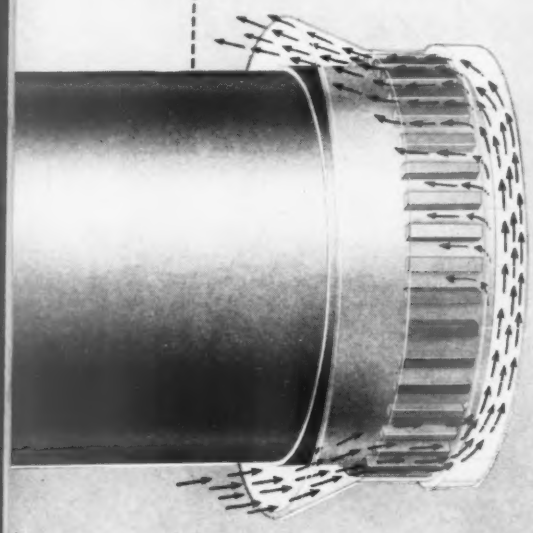
Profitable Cement Production!

2 INSTALL AN AIR-COOLED DISCHARGE END

This modernization improvement will actually pay for itself in 2 to 3 years in refractory savings alone! Big savings in downtime, too, because fewer shutdowns are required to replace end brick. You gain valuable production time. An Air-Cooled discharge end helps maintain a positive air seal between firing hood and kiln, resulting in fuel savings. Discharge end distortion is eliminated. Kilns now in operation can be modernized easily with an Allis-Chalmers Air-Cooled discharge end.

3 INSTALL A MOVABLE FIRING HOOD

Another profitable way to modernize — an Allis-Chalmers movable firing hood will maintain an excellent air seal with the kiln, saving fuel by reducing hot air loss at kiln end and keeping out infiltering cold air. Movable design compensates for expansion and contraction of kiln shell. Allis-Chalmers firing hoods are built to use standard refractory brick lining. They're heavily constructed, to stay rigid throughout years of service, and have convenient access and inspection openings.



A-4437

ALLIS-CHALMERS

A-C ALLIS-CHALMERS

Port Colborne - A Wet Process Plant

(Continued Canada Cement Co. story from page 89)

PORT COLBORNE is a single-kiln wet process plant on the north shore of Lake Erie about 30 miles from Niagara Falls, Canada. This mill has undergone no major expansion in the postwar period under consideration but has been kept modern through the installation of dust collectors and other equipment. In addition, a modern machine shop, including an automotive repair shop, has recently been constructed.

Source of stone is 2½ miles distant, necessitating a haul by Euclid trucks to a rail point and delivery to the plant in 12-ton cars. Stone supply in this area is limited. Quarries are necessarily shallow because they bottom on high magnesia stone, and the stone is heavily folded. Approximately 55 percent of the limestone used is purchased high calcium stone shipped in from Beachville, Ontario. The quarry is shallow, the depth being limited by high magnesia stone. A study of the flotation possibilities of high silica stone has been carried out with encouraging results.

Port Colborne was rebuilt in 1932 when the present 11-ft. 3-in. by 10-ft. by 11-ft. 3-in. x 412-ft. rotary kiln was installed. This kiln has Unax coolers, is coal-fired by air-swept ball mill and is exhausted through a Multiclone stack dust collector. F. L. Smidth dust return equipment is ordered for installation within the year.

Stone is crushed through a gyratory crusher, to be followed by a hammer mill, and is placed in open storage. Clay is excavated from a pit, using a dragline shovel, and is trucked approximately three miles to a 26-ft. wash mill and then pumped into an air-agitated storage basin.

Raw grinding is by two 7- x 39-ft. Unidan mills in open circuit and finish grinding is in open circuit.

Cement storage consists of large diameter silos in addition to the rectangular stockhouses, and packing is through a modern four-story packhouse, which has facilities for bulk, truck and car loading, in addition to bags. There is also a modern belt conveyor loading system at the dock for loading Canada Cement Co.'s bulk-carrying cement boat for shipment to Windsor or Toronto.

The office and laboratory building is a modern structure, with the plant offices on the main floor and chemical and physical laboratories on the second floor.

a new PAYLOADER®

LOOKS THE SAME... BUT DOES MORE WORK

Four-wheel-drive • Torque converter • 4-speed, full-reversing transmission • Power-steering • Hydraulic brakes Quick tip-back bucket • Automatic bucket positioning.

MODEL **HRC**

CAPACITY
1 CU. YD. STRUCK-LOAD
1 ⅛ CU. YD. PAYLOAD

HERE IS THE FINEST tractor-shovel for its size ever built. It has undergone extensive field testing that proves it is without equal in work output, versatility, ruggedness and ease of operation. Its unique combination of torque converter drive and Hough four-speed, full-reversing transmission provides "just-right" speeds, forward and reverse, for every job — plus smooth, shockless power flow at all times.

Your "PAYLOADER" Distributor is eager to explain ALL the advantages of the Model HRC and show what it will do for you.

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Libertyville, Illinois

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CITY.....STATE.....

☐ Please have Distributor call
☐ Send information on all seven PAYLOADER models

705

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THE FRANK G. HOUGH CO. • LIBERTYVILLE, ILL.

Havelock Plant

(Continued from page 103)

bbl. in the silos and storage bin. Each silo measures 50 ft. in diameter by 120 ft. and has a capacity of 50,000 bbl. Four 16-in. screw conveyors below are the means of transfer to an 18-in. collecting screw conveyor for delivery to the packhouse. The stream is put over a Dillon vibrating screen and then fed into two packer machine bins by screw conveyor which may also convey the cement outside for bulk loading. Two No. 111 F.C. St. Regis packers have a capacity of 4000 bbl. in 8-hr. Provision has been made for a parallel conveying system and installation of an additional packing machine in the event masonry cement is produced.

Maintenance — Electrical

Havelock is far removed from any metropolitan area, so has a well-equipped machine and welding shop and maintains a large stock of parts. Electric power is brought in at 69,000 volts and stepped down to 4160 volts for the large motors. Power distribution is to departmental load centers, and switchgear, starters and controllers are of latest type.

The plant office and laboratory is a modern structure, having a full basement, offices on the first floor and a well equipped physical and chemical laboratory on the second floor. Landscaping in the area around the office building is proceeding well, and other areas will be similarly treated as time permits.

Havelock is one of two plants in North America which operated its first year without a lost-time accident, which record is still intact.

Operating Practices

(Continued from page 94)

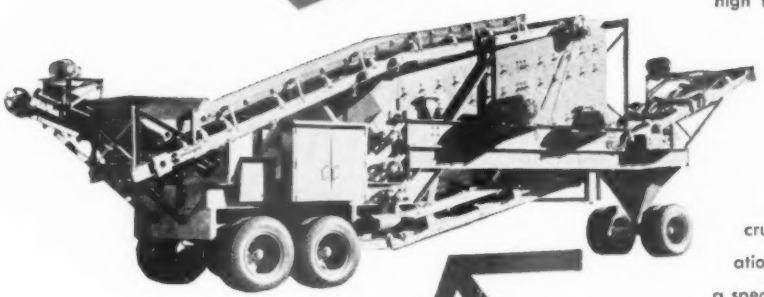
and Exshaw. Over recent years, blasting efficiency has been improved and the spacing and burden of blast holes increased with improved results. Millisecond delay, progressive blasting has become standard practice and, recently, the use of Nitron explosives with MS connectors in thick-bedded limestones.

Most excavating equipment is with Bucyrus-Erie shovels but there are some Dominion power shovels also in service.

Crushing

Primary crushing equipment consists of either jaw or gyratory crushers, the maximum size being 54-in. Traylor gyratory crushers. Secondary reduction is standardized, using Pennsylvania reversible impactors in closed-circuit with vibrating screens to produce a raw mill feed of ¾-in. top

UNIVERSAL PORTABLE SCREENING AND BLENDING UNIT INCORPORATES SIMPLICITY 5'x14' 3-DECK SCREEN WITH BALL TRAY



At the Anderson-Oxandale aggregate plant in Herington, Kansas, they're getting exceptionally high tonnage of good quality aggregate for State road requirements with a Universal crushing plant and portable screening and blending unit. Heart of the screening and blending unit is a Simplicity 5' x 14' 3-deck inclined gyrating screen equipped with a ball tray deck. Handling up to 150 yards of crushed dolomite limestone an hour at this operation, the 70 square foot Simplicity screen produces a specification aggregate consisting of 100% passing 1", 90% passing ¾" and 50 to 60% passing ¼". Specification of product can be easily varied according to job requirements. To our knowledge this is the largest screen offered in a portable crushing and screening plant.

Simplicity Gyrating Screens with single, double and triple decks are available in a wide range of sizes for fast, accurate and efficient sizing and separating operations. For complete information, consult a Simplicity sales engineer or write us today.

Simplicity
TRADE MARK REGISTERED

ENGINEERING COMPANY • DURAND, MICHIGAN

- **Sales representatives in all parts of the U.S.A.**
- **For Canada:** Canadian Bridge Engineering Company, Ltd., Walkerville, Ontario
- **For Export:** Brown and Sites, 50 Church Street, New York 7, N. Y.

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size, in order to accomplish maximum grinding in the raw mills. Raw grinding mills in most plants consist of large muti-compartment Unidans and Unikoms. A number have slide-shoe bearings. Large diameter ball mills in closed circuit with mechanical air separators are in use in the dry process plant raw mill. Larger diameter ball mills in closed circuit with mechanical separators are also being adopted in the newer clinker grinding installations. As stated earlier, raw grinding is done in open circuit in all the wet process plants. Fineness of grind ranges from 90 to 93 percent through the 200-mesh sieve.

There are centralized covered storage areas with overhead electric cranes for raw materials at five plants and for clinker at four plants, paralleling the trend in U. S. plants. Clinker is crushed to 3/8-in. top size through Symons short-head cone crushers preliminary to grinding in five plants. Hardinge clinker feeders, Merrick Feedoweights and pan feeders are in use at the various mills.

The Bates III F. C. Packer is the standard packing machine for loading both trucks and railway cars. There are 41 machines in service and the packing rate is 1400 bags per hr. with one operator on each machine.

Superintendents and chemists at the production plants are as follows:

Montreal East
- Taylor Kennedy, superintendent
- J. A. Grosskurth, assistant superintendent
- L. E. Shipley, chemist

Belleville
- J. H. Legate, superintendent
- A. O. Drysdale, assistant superintendent
- H. C. Brown, chemist

Exshaw
- K. E. Alexander, superintendent
- W. E. Court, assistant superintendent
- D. H. Thomas, chemist

Havelock
- H. W. Hamilton, superintendent
- Henry Weedon, assistant superintendent
- W. H. Cameron, chemist

Port Colborne
- J. B. Hanly, superintendent
- H. Narsted, assistant superintendent
- G. H. Jones, chemist

Hull
- D. A. Casper, superintendent
- T. T. Truesdell, assistant superintendent
- R. F. Haskett, chemist

Fort Whyte
- C. W. Edmonds, superintendent
- A. Stewart, assistant superintendent
- J. S. Shipley, chemist

Charles H. Baker was recently appointed kiln supervisor for all plants. G. L. Colborne is company geologist.

NOW!

you can get big drill performance with the

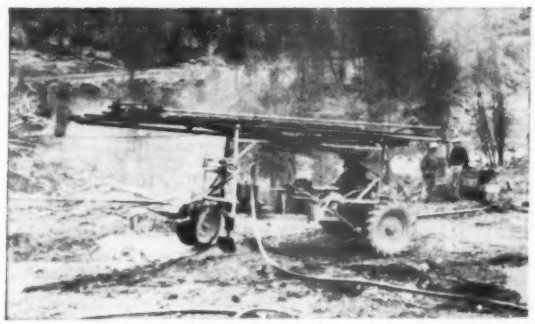
CHALLENGER

Blast Hole Drill

HERE'S WHAT USERS SAY:

"Drilling cost per ton of ore broken reduced by two-thirds over wagon drills. Driller experience can further reduce to one-sixth of wagon drilling cost."

"Punched down four 60′ holes, bottoming at 4″ dia., in one shift. What a drill!"



THREE MODELS . . . EXTREME MOBILITY

Three models of the Challenger Drill are available . . . all extremely mobile. Illustrated above with mast down in tramming position is the Model TWM-2A Challenger, self-propelled by two reversible Pistonair motors. At top right is a gasoline-propelled model, the TWM-2. The third model, the TWM-3, (not shown) is available for customer mounting on a crawler-tread tractor or similar vehicle.

Users' reports on units in operation show that you really get big drill performance with the Challenger Drill. It's a 5¼″ hammer drill (not a piston drill) that drills 4½″ diameter holes in hardest rock to depths of 50′ or more. This big drill performance calls for a 26′ feed to cut the number of steel changes, and a self-propelled mounting. The Joy Challenger is the biggest cost-cutting big drill for hard rock drilling. Check your needs . . . see if this big drill won't answer your problems. ● ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

Consult a Joy Engineer

W&D C48388

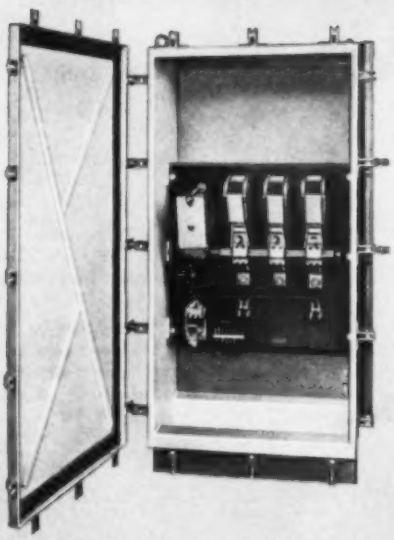
JOY

WORLD'S LARGEST BUILDER OF CORE DRILLS, ROTARY BLAST HOLE DRILLS AND MOTORIZED DRILL RIGS

SPECIALIZED CONTROL for a ROUGH TOUGH JOB

ALLIS-CHALMERS

CONTROL



400-horsepower, 440-volt controller for squirrel-cage motor or primary of wound-rotor motor. Dust-tight enclosure.

Custom-Engineered Protection for Motors Driving Crushers

PROTECTING A MOTOR driving an ore or rock crusher is a particularly complex control problem. In crushing, motor burdens (resulting from high inertias or extreme fluctuation of loads) dictate protection far beyond that provided by standard controllers. Only control engineered for your specific job can provide adequate protection.

An Allis-Chalmers control application starts with expert analysis of your problem by an A-C representative. Type of crusher, specific crushing conditions, and cost weighed against lost production are all factors in determining the kind and degree of protection he will specify. All recommendations are backed by complete research and testing facilities . . . by unsurpassed skill and experience in design, manufacture and application. For complete information, call your nearby A-C representative or write for Bulletin C53-424, Allis-Chalmers, Milwaukee 1, Wis.

A-4306

ALLIS-CHALMERS

Directors of N. A. L. I. Oppose Soil Acidity Test for A. C. P.

National Agricutural Limestone Institute directors' meeting in Cincinnati, Ohio discusses Agricultural Conservation Program. Suggest scientific research

By HUBERT C. PERSONS*

VIGOROUS OPPOSITION to the idea of making the soil acidity or pH test a mandatory provision of the Agricultural Conservation Program was expressed at the midyear board of directors' meeting of the National Agricultural Limestone Institute in Cincinnati, June 17 and 18. The directors made it clear that the Institute is not opposed to the test but takes the position that because there is wide divergence of opinion among soil scientists, as to its value, the test should not be made the limiting factor in the application of limestone.

Reports of the attitude of farmers and agricultural leaders in the five N.A.L.I. regions were asked from the directors. In asking for this informal opinion poll, Robert M. Koch, executive secretary of the Institute, revealed that on May 19, the Institute had mailed 5000 reprints of an article on the use of agricultural limestone by Dr. Wm. A. Albrecht, chairman of the Department of Soils, University of Missouri. (ROCK PRODUCTS, April, 1954). The article, with a covering letter, was sent to agricultural leaders, including the Secretary of Agriculture, deans of agricultural colleges, agricultural extension directors, heads of experiment stations, agronomists, county agents and county and state A.S.C. committees.

The letter, signed by Executive Secretary Koch, was personally addressed in each instance. The letter pointed out that too much emphasis was being placed upon soil acidity and that it would be a serious mistake to allow mandatory pH tests to be the limiting factor in connection with the application of agricultural limestone. Agricultural experiment stations had shown that a soil's capacity to exchange various items of fertility—calcium, magnesium, potash, phosphorus—is much more important than the pH of soil.

Reports from Regions

Discussions of the letter and Dr. Albrecht's article at an evening session on June 17, brought out the opinions that the full potential of benefit from the Agricultural Conservation Program is not being realized. Some regions reported a 100 percent increase in agricultural limestone business over 1953 while some regions reported not more than 12 percent of last year's volume. It was evident that there is a wide variation in the operation of the program; that no one formula fits conditions in all states and that the problems are at the state level. It was reported that in many states about one-third of the funds available under the Agricultural Conservation Program are going for various fertilizers rather than limestone.

Reports from some states complained of "unworkable regulations" in connection with the soil conservation program. Several reports indicated that the soil testing regulation is a bottleneck which is slowing down use of agricultural limestone. However, in other areas the belief was expressed that compulsory soil testing stimulates use of limestone and that the testing program is working well. The most general apprehension regarding the soil testing program was that if the pH test is made mandatory it might create an artificial barrier to the further use or continued use of agricultural limestone.

Urges Scientific Research

John M. Deely of Lee, Mass., president of the Institute, urged the necessity of scientific research on the subject of soil testing. At the board session the morning of June 8, President Deely declared that the Institute should urge the U.S. Department of Agriculture to set up such a research program.

The membership of the National Agricultural Limestone Institute comprises 359 producing companies, according to the report of Executive Secretary Koch. He said the goal was 500 members. Russell W. Hunt of Neosho, Mo., chairman of the committee on Active Membership, declared that the Institute has a membership potential of 1000 because there are

*Public relations consultant, formerly manager, Public Relations Bureau, Portland Cement Association

that number of agricultural limestone producers in the country.

$195 Million Program for 1955

Secretary Koch reported that indications were that at least $195,000,000 would be available for the Agricultural Conservation Program for 1955 and for the next few years. Additional funds may be available, he said, because of diverted acres. This year, he reported, there is possibly a $20 million greater potential for agricultural limestone because certain practices with regard to fertilizers are now prohibited.

A new method of electing officers and directors was recommended in the report of the Election Procedure Committee, of which Philip E. Heim of Lowellville, Ohio, is chairman. The term of office of vice-presidents is to be three years, and vice-presidents cannot succeed themselves.

A nominating committee was named consisting of the five regional vice-presidents and two directors from each region. Members of the board of directors will have the power to add to list of nominees. Balloting will be by mail.

1955 Meeting in Cleveland

The midyear board meeting in 1955 will be held June 9 and 10 in Cleveland, Ohio. Chicago was recommended as the scene of the 1956 convention scheduled to open January 28. John H. Riddle, Salina, Kan., is chairman of the convention Arrangements Committee.

Recommendations of the Institute's Promotion and Education Committee for the issuance of a monthly news letter and a campaign to make the Promotion Committee a clearing house for all advertising and promotion ideas of members were approved by the board of directors. The committee members urged the closest possible cooperation of the Institute with agricultural colleges and administrators of the Agricultural Conservation Program. In commenting on the report of the Promotion Committee, President Deely pointed out that promotion and educative work on the uses of agricultural limestone "are of extreme importance both to the public and to ourselves."

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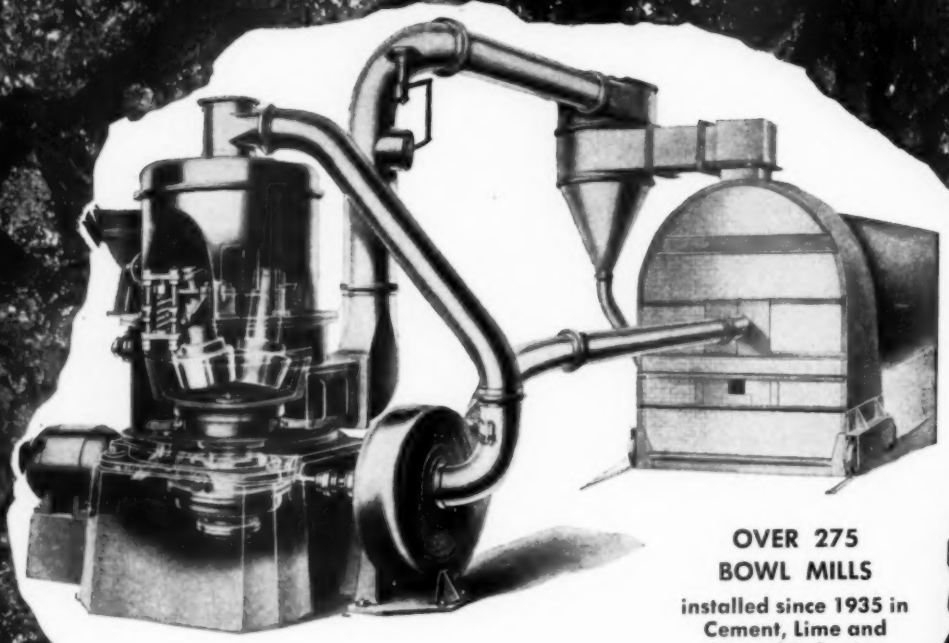
TRUMBULL ASPHALT CO. of Delaware has been granted a corporation charter in Oklahoma. Authorized capital stock consists of 1000 shares, no par value. Registered agent is A. H. Mahnker, Oklahoma City, Okla.

IDAHO PERLITE, INC., Boise, Idaho, was recently incorporated with a capital stock of $100,000. A. C. Winsky, Kathryn Winsky, and Eric Osterberg, all of Boise, are the directors.

Modernize Your Cement Production

BOWL MILL FIRING



OVER 275 BOWL MILLS

installed since 1935 in Cement, Lime and burned Dolomite fields alone

RAYMOND Bowl Mills are pulverizing more than 12½ million tons of coal annually for direct firing applications on cement, lime and dolomite kilns, and industrial furnaces.

The widespread use of Bowl Mill Firing is indicative of industry's appraisal of this modern unit in terms of operating economy and dependable service.

It offers the following important advantages:

Handles coal of any grade or moisture content
Easily adjusted or lubricated while running
Sturdily built for continuous 24-hour operation
High availability and wide capacity range
Uniformity in grind and complete firing control

The bowl or grinding chamber revolves around the rotating rollers—a unique feature that results in maximum grinding efficiency. The centrifugal action forces the coal between the pulverizing elements constantly—no waste motion or dead spots. Elimination of metal-to-metal contact between grinding surfaces reduces wear to a minimum.

Write for Bowl Mill Catalog #62

Bulletins ON REQUEST

COMBUSTION

RAYMOND DIVISION

with RAYMOND EQUIPMENT
WHIZZER SEPARATION

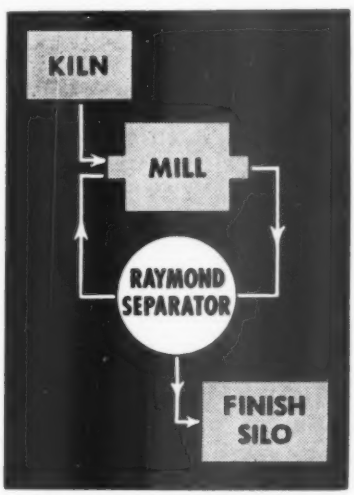
The exclusive Whizzer feature is what makes the "difference" in the performance of the Raymond Mechanical Air Separator.

The wide sweep of the revolving whizzer blades helps to distribute the powdered material in the air stream, and insures closer separation of the fines, cleaner tailings and a consistent uniform product.

This is important in classifying cement—either raw mix or clinker—as it gives better control over specific surface areas in making various grades. It also provides a greater fineness range—and with a Double Whizzer Separator, you can produce standard grades or high early strength cements by an outside adjustment while the machine is running. No need of shutting down to make internal changes.

The overall economy of the Raymond Separator is a factor in keeping down the per-barrel cost of cement. Low power requirements, minimum maintenance, increased mill output in closed circuit operations, and long service life, all help to make the Raymond Whizzer Separator a sound capital investment.

NEW CATALOG
No. 71



RAYMOND DOUBLE WHIZZER
Mechanical Air Separator

Available for various capacities in sizes of 4 Ft. to 18 Ft. Diameters—Also 30-Inch Separator for laboratory or small commercial operation.

The Raymond Whizzer Separator is an important link in the closed circuit operation of tube mills for cement production.

Raymond Laboratory Separator for making test runs for any type of fine particle size materials.

ENGINEERING, INC.

1307 North Branch Street, Chicago 22, Illinois

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MANUFACTURERS NEWS

WESTINGHOUSE ELECTRIC CORP. and Baldwin-Lima-Hamilton Corp. have jointly announced that Baldwin-Lima-Hamilton has reacquired 515,000 shares of its own common stock by purchase from Westinghouse for $4,635,000, or $9 a share. Five hundred thousand of these shares were originally sold to Westinghouse by Baldwin Locomotive Works in 1948 to provide working capital for diversification of its products and to assist in financing the changeover from manufacture of steam locomotives to diesel locomotives.

IOWA MFG. CO., Cedar Rapids, Iowa, announces the appointment of Don Gugler as district sales representative in Michigan, Ohio, Indiana, West Virginia, Kentucky and western Pennsylvania, with headquarters in Columbus, Ohio.

GENERAL ELECTRIC CO., Syracuse, N.Y., has announced the appointment of Neal F. Harmon, Edsin W. Kenefake and James D. Helm as sales managers in the communications equipment unit of the commercial equipment department.

KENSINGTON STEEL CO., Chicago, Ill., announces that H. Monteith Albers, vice-president, has been elected to the board of directors and appointed a member of the executive committee.

FOXBORO CO., Foxboro, Mass., has appointed W. H. T. Furry as director of the training and educational division. He succeeds Malcoln B. Hall who has retired after 40 years of service with the company. Mr. Furry was formerly instrument training coordinator at the Atlantic Refining Co., Philadelphia.

KOEHRING CO., Milwaukee, Wis., has announced the appointment of D. W. Marchant as vice-president and general manager of Koehring Southern Co., Chattanooga, Tenn., a subsidiary, and the appointment of N. J. Decker as assistant to E. A. Brugger, vice-president in charge of manufacturing at the Milwaukee plant and subsidiaries.

MCLANAHAN & STONE CORP., Hollidaysburg, Penn., has appointed the Aggregates Equipment Co., Lancaster, Penn., as distributor throughout the state of Pennsylvania.

AIR REDUCTION CO., INC., New York, N. Y., announces that S. H. Newburn has been appointed president of Air Reduction Canada Limited, with headquarters in Montreal, Canada. He was formerly regional manager of the north-central region of Air Reduction Sales Co. in Chicago and will be succeeded by D. F. McCandlish. S. S. Bruce, Jr., zone manager of the eastern region of the railroad department, succeeds Mr. McCandlish as Chicago district manager of Air Reduction Sales Co.

BAY CITY SHOVELS, INC., Bay City, Mich., announces the election of Donald E. Hawkins as president of the company in addition to his duties as treasurer. He succeeds Morgan Ramsay who has retired because of ill health. Mr. Ramsay will continue on the board of directors and serve in an advisory capacity. Mr. Hawkins joined the company in 1928 and was named a director in 1943. He was appointed secretary-treasurer in 1947. The position of secretary has been filled by Morgan Ramsay, Jr.

UNITED STATES RUBBER CO., New York, N.Y., has announced the appointment of Chester J. Noonan, vice-president, as executive general manager of the footwear and general products division and the mechanical goods division.

H. K. PORTER CO., INC., Philadelphia, Penn., announces the appointment of W. H. Pender as manager, belting sales, Quaker Rubber Corp. He was formerly field engineer for conveyor and elevator belting.

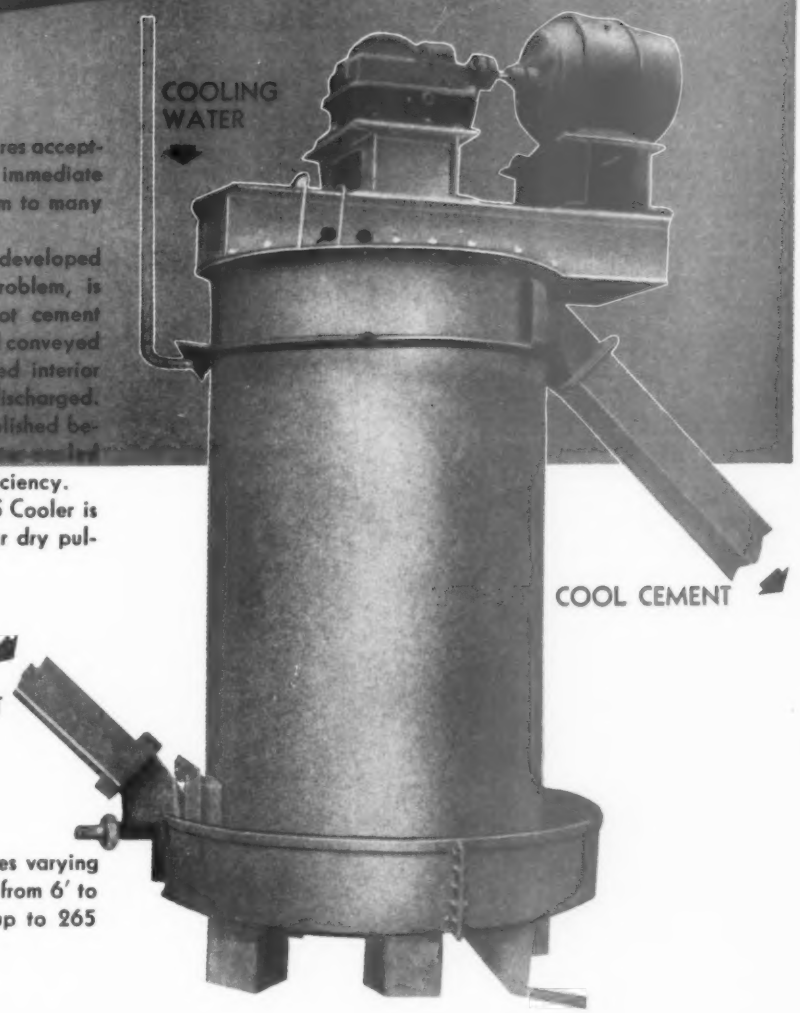
For Cooling Hot Cement

FLS

Cooling hot cement to temperatures acceptable for bulk shipment or immediate bagging is an important problem to many cement manufacturers.

The FLS Cement Cooler, developed especially to overcome this problem, is externally water-cooled, the hot cement being introduced at the base and conveyed in a thin layer along the cooled interior surface to the top, where it is discharged. Thus an intimate contact is established between the cement and the water-cooled surface, assuring high cooling efficiency.

In addition to cement, the FLS Cooler is applicable to many other similar dry pulverized materials.



FLS Coolers are furnished in sizes varying from 3′ to 6′6″ in diameter and from 6′ to 18′ in height, with capacities up to 265 barrels of cement per hour.

F. L. Smidth & Co., A/S
Vestergade 33,
Copenhagen K, Denmark

F. L. Smidth & Co.
11 West 42nd Street
New York 36, N. Y.

F. L. Smidth & Co., Ltd.,
105, Piccadilly,
London, W. 1, England

F. L. Smidth & Cie France
80 Rue Taitbout
Paris (9e) France

F. L. Smidth & Co. of Canada, Ltd.
11 West 42nd Street
New York 36, N. Y.

F. L. Smidth & Co. (Bombay) Ltd.
42 Queen's Road
Bombay, India

Caterpillar Tractor Co., Peoria, Ill., announces that G. E. Burke, director of engineering, has been appointed director of engineering and research. The research department continues under the management of J. M. Davies, director of research, and the engineering program continues under the direction of J. E. Jass at Peoria; L. C. Frank at Milwaukee; and C. L. Kepner at Joliet.

Nordberg Mfg. Co., Milwaukee, Wis., has announced the appointment of George V. Dutney as special assistant to the president, Robert E. Friend, in sales and special public relations. Mr. Dutney, formerly manager of sales for Johns-Manville, will make his headquarters in New York.

Hyster Co., Portland, Ore., has announced the appointments of Robert F. Moody as eastern division sales manager; Jack Wright as district manager in the northwestern district; James N. Rector as district manager of the southeast territory; and Robert Hile as general manager of the retail store in Chicago.

International Paper Co., New York, N. Y., announces that a new converting plant has been opened in Mobile, Ala., by the Bagpak division for production of multiwall sacks used in packaging cement, lime, gypsum and other rock products as well as chemicals, sugar, flour, feeds and fertilizer.

Atlas Powder Co., Wilmington, Del., has announced the retirement of Daniel D. Huyett after 34 years of service. He was head of mechanical process development engineering in the research and development section of the explosives department.

Borg-Warner Corp., Chicago, Ill., announces that Robert G. Allen has been elected president and general manager of the Pesco products division. He succeeds Robert J. Minshall, who has been named chairman of the supervisory board and director of research and development for the division.

Waldrip Engineering Co., Hollydale, Calif., announces that Freeman Gates, former assistant production manager for Consolidated Rock Products Co., Los Angeles, Calif., has been appointed manager of the aggregate and mining machinery division.

Coast Metals, Inc., Little Ferry, N.J., has announced the election of George S. Mikhalapov as president of the company to succeed John P. Rutherford.

The Babcock & Wilcox Co., New York, N.Y., has announced the appointment of G. A. Profita as regional manager of the manufacturing department of the boiler division.

Caterpillar Tractor Co., Peoria, Ill., announces that Henry H. Howard has been elected vice-president in charge of the engine division, of which he was appointed manager in 1953.

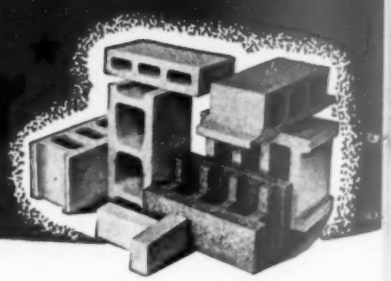
CONCRETE PRODUCTS

A SECTION OF ROCK PRODUCTS

CONCRETE UNITS · READY-MIXED CONCRETE

Precast concrete louvres for patios and garages made by Pre-Cast Corp., Miami, Fla.

Another BESSER Booster*



★ This is the 110th of a series of ads featuring leaders in the Concrete Products Industry who are stepping up block production with Besser Vibrapac machines.

Glenn Ruegsegger, President and General Manager of Euclid Block Company, and his father, Fred Ruegsegger, Secretary and Treasurer.

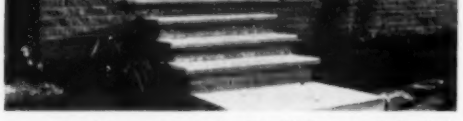
Both Father and Son Prefer Vibrapacs at this Progressive Bay City Plant

Euclid Block Company, Bay City, Michigan, has been an enthusiastic user of Besser equipment since 1947. At that time, the company installed its first Vibrapac machine, a rear pallet feed model. Increased sales necessitated the installation, recently, of a second block machine, this time a modern Front Pallet Feed Vibrapac. Today, the Euclid Company produces more than a million block (8" or equivalent) per year.

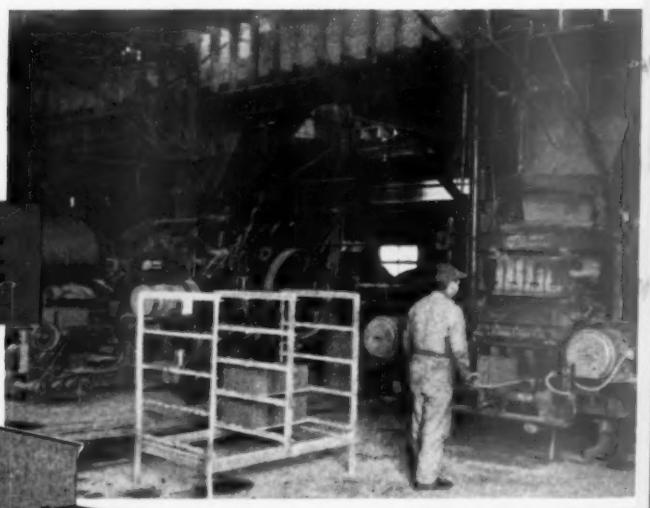
Speaking of the Besser Vibrapac, Glenn Ruegsegger, President and General Manager, states: **"It is the best block machine for high production and profit making".** That's why, when a Vibrapac user requires additional equipment, he invariably orders more Vibrapacs.

BESSER MANUFACTURING CO. • Box 135 • Alpena, Mich., U.S.A.

Complete Equipment for Concrete Products Plants



A small home built with BES-STONE — the Split Block with Character. The Euclid plant is also equipped with a BES-STONE Block Splitter.



Interior view of Euclid Block Company plant showing two Besser Vibrapac machines in operation. Each machine is fully automatic. Hand labor is reduced to pushing a switch button and guiding a power off-bearing belt.

Yard scene at the Euclid plant. High quality block — both cinder and sand and gravel units, as well as cinder brick and BES-STONE Split Block are distributed through dealers within a 50 mile radius of Bay City.

BESSER
50th Anniversary
1904-1954

A 7946-1PBC

A Half Century of Concrete Masonry Progress

INDUSTRY NEWS

Ready-Mix Plant

CARTHAGE READY MIX, a new company recently established at Carthage, Ill., has started operation of a ready-mixed concrete plant on property leased from the Burlington railroad. Plant facilities include two 50-ton aggregate bins and a third bin which will hold 125 bbl. of cement, in addition to a 500-bbl. capacity cement-storage silo. Car unloading conveyors and elevators have also been provided. Manager of the new plant is K. M. Baker who owns a half interest in the company and also operates the Certified Ready Mix plant in Keokuk, Ill. The two plants will be operated in conjunction, with a total of seven transit-mixer trucks available.

Cover Picture

ON THIS MONTH'S CONCRETE PRODUCTS' COVER is an illustration of a home in Miami, Fla., with an attached garage having precast concrete louvres. This is one among many interesting and useful products made by the Pre-Cast Corp., Miami, one of the most rapidly growing enterprises in southern Florida. Other concrete products include: combination window frames and panels, exterior wall panels, fencing, interlocking panels for swimming pools, and precast concrete columns. Its most recent venture is the manufacture of prestressed concrete beams by the Freyssinet system.

Concrete Slab Plant

UNIVERSAL CONCRETE PIPE CO., Columbus, Ohio, has begun production of its third Flexicore precast concrete slab plant, as recently announced by T. H. Monaghan, vice-president. The new plant, which is the first of its type to be established in West Virginia, is located at New Martinsville, with sales offices in Wheeling and Clarksburg. Earl W. Chidester is head of the new operation, with Sam Buderman as sales engineer and Garth Poe as plant manager.

The new plant will produce slabs in both 8- x 16-in. and $6\frac{5}{16}$- x 12-in. cross-sections, with lengths available in inch variations up to 32 and 22 ft. respectively. Initial production capacity is 100,000 sq. ft. annually.

Universal opened its first Flexicore plant in Tampa, Fla., in February, 1952. Increasing demand reportedly pushed production ahead so fast that Universal contracted with Flexicore Co., Inc., for a second territory and, in mid-1953, the second plant began production at Miami, Fla.

Safe-Driving Awards

MARIETTA CONCRETE CORP., Marietta, Ohio, recently presented more than $1000 in defense bonds to 44 of its truck drivers at a safety-awards dinner. One driver was presented a 23-year award for having no accidents charged to him during that period. Four other drivers also received special awards, with two having completed 15 years of safe driving; one, 13 years; and another, ten years. Thirty-nine other employes were also presented $25 defense bonds for having no accidents charged to them during the past year. F. Leonard Christy, president, made the presentation in behalf of the company. Guest speaker at the dinner was K. W. Laughlin, Ohio state highway patrolman.

Over 100 delegates to Universal Concrete Pipe Co.'s annual sales meeting in Columbus, Ohio, visited the company's new pressure pipe plant at Columbus. Shown above during inspection trip are, left to right: H. E. Eschenbrenner, vice-president of Universal; J. W. Corson, general manager, Lamar Pipe & Tile Co., Grand Rapids, Mich., and also vice-president, American-Marietta Co., Chicago, Ill. (parent company of both Universal and Lamar); R. L. Oughton, Chicago, president of Universal and vice-chairman of the board of American-Marietta; and John K. Turner, Chicago advertising executive

SIGOURNEY READY MIX CO. has begun operation of a new batching plant at Sigourney, Iowa. Plant facilities include a 100-ton steel bin for sand and gravel storage, four transit-mixer trucks, and automatic equipment for unloading bulk cement and other materials from railroad cars. The new firm is associated with Ideal Ready Mix Co. of Ottumwa and Oskaloosa, Iowa, and headed by Leon Yates of Ottumwa.

SILVERNALE CONCRETE PRODUCTS CO., Currie, Minn., owned and operated by John Silvernale, has completed expansion of its concrete products plant. A new addition to the plant building will house a new hopper and weighing machine. New office and storage facilities have also been provided.

BATTLE CREEK CONCRETE PRODUCTS CO., Battle Creek, Mich., has expanded its operations by the addition of a ready-mixed concrete plant. The company is owned and operated by John Postma, John Postma, Jr., and Robert M. Postma.

ELK RIVER CONCRETE PRODUCTS CO. has opened a new plant at Olivia, Minn., for the production of reinforced concrete pipe, precast cattle passes, gasket pipe, concrete manholes and bell-end sewer pipe. Larry Dorn is in charge of plant operations.

A $200,000 CONCRETE BATCHING PLANT was recently opened at Napa Junction, Calif., by C. M. Syar, contractor, Vallejo, Calif. Plant capacity is 1000 cu. yd. of concrete daily.

UNION CONCRETE PIPE CO., Ceredo, W. Va., has announced acquisition of property at West Palm Beach, Fla., for the construction of a concrete pipe plant.

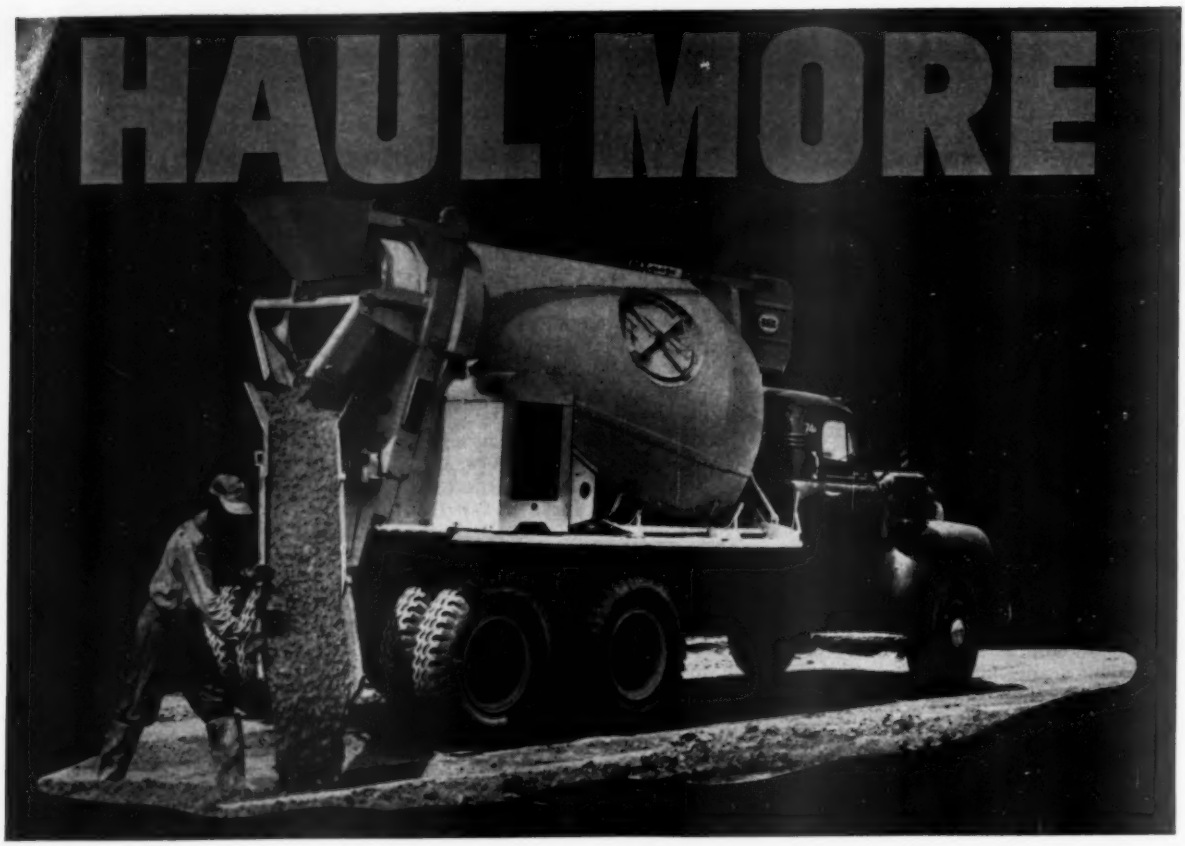
A READY-MIXED CONCRETE PLANT has been opened at Coralville, Iowa, by Wilbert Frantz and James L. Ryan, who will operate the plant under the name of Johnson County Ready-Mix.

A READY-MIXED CONCRETE PLANT has been established at Powell, Wyo., by Al Frazier and Don Lucas, Glenwood Falls, Colo.

WARBURTON'S READY-MIX CO. has started operation of its new $75,000 ready-mixed concrete plant at Pleasant Grove, Utah.

DUPUY RANSONE, JR., Onancock, Va., successor to the former B. A. Colonna Co., a concrete firm, has expanded plant operations by the addition of a ready-mixed concrete plant.

CONSTRUCTION SERVICE CO., Great Bend, Kan., has established a ready-mixed concrete plant at Larned, Kan. Victor E. Baum is plant manager.



...with Rex Adjusta-Wate Moto-Mixers

EVERY TRIP...because the exclusive Rex Adjusta-Wate design places load centers of gravity farther forward so that *all* axles of the truck can be loaded for *maximum legal payload.*

EVERY DAY...because the Rex Adjusta-Wate combines "time-saving" operating advantages, cutting minutes from each mixer operation. These minutes *saved* make possible shorter trip cycles...resulting in *more trips per day.*

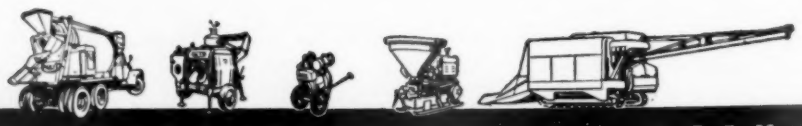
EVERY SEASON...because the Rex Adjusta-Wate is built for years of dependable, heavy-duty operation, free from costly maintenance. Today, profitable ready-mixed plant operation demands a mixer to roll day after day, all season long without interruption.

The Rex Adjusta-Wate has the rugged construction and balanced design that mean lower maintenance cost, less down time, bigger legal payload...*every season.*

Add to profits...not to costs with a
Chain Belt Company, 4649 W. Greenfield Ave.
Milwaukee, Wisconsin

REX ADJUSTA-WATE

CHAIN BELT REX COMPANY



CONSTRUCTION MACHINERY

MOTO-MIXERS® MIXERS PUMPS PUMPCRETES® PAVERS

ONE-MACHINE BLOCK-PLANT

ONE *Columbia* 12" HIGH MAKES

WATER METER BOXES • DRAIN TILE • SILO STAVES • FLUE LINERS • PARTITION BLOCKS AND OTHER SPECIAL SHAPES

The Columbia 12"-High—on standard plain pallets and in its regular fast cycle—makes all the special shapes listed above... and many others! Some of these shapes have never before been produced on a standard block machine. NOW, with Columbia, block makers can enter these highly profitable fields... with a rugged, tested machine that gives automatic high production. Available in two-block and three-block sizes.

PLUS ALL STANDARD BLOCKS IN 4"-8"-12" HEIGHTS

With a quick mold change, Columbia 12"-High can produce any of the more than 250 standard blocks made by its sisters, the Model 8 and Model 12. That's why we call the 12"-High ..."the One-Machine Block Plant"!

District Offices in: Wisconsin, Ohio, South Carolina, Mississippi, Florida, New Jersey, Virginia, California and Massachusetts.

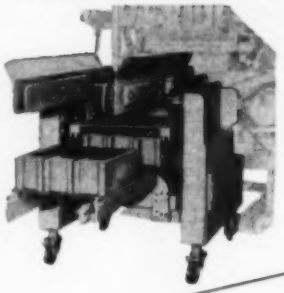
Columbia MACHINE

Home Office: 107 S. GRAND, VANCOUVER, WASHINGTON
Factory Branch and Warehouse at Mukwanago, Wisconsin

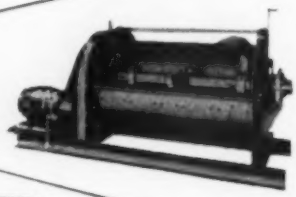
WRITE TODAY!
for folder giving complete information on Columbia 12"-High

BERGEN

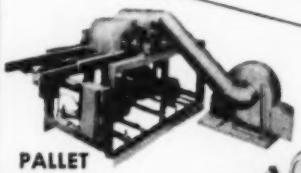
The "know-how" to produce . . . .



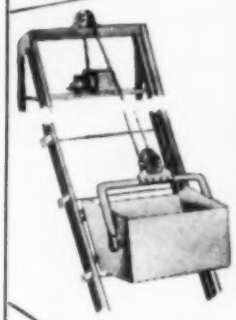
FRONT PALLET RETURN



BATCH MIXER

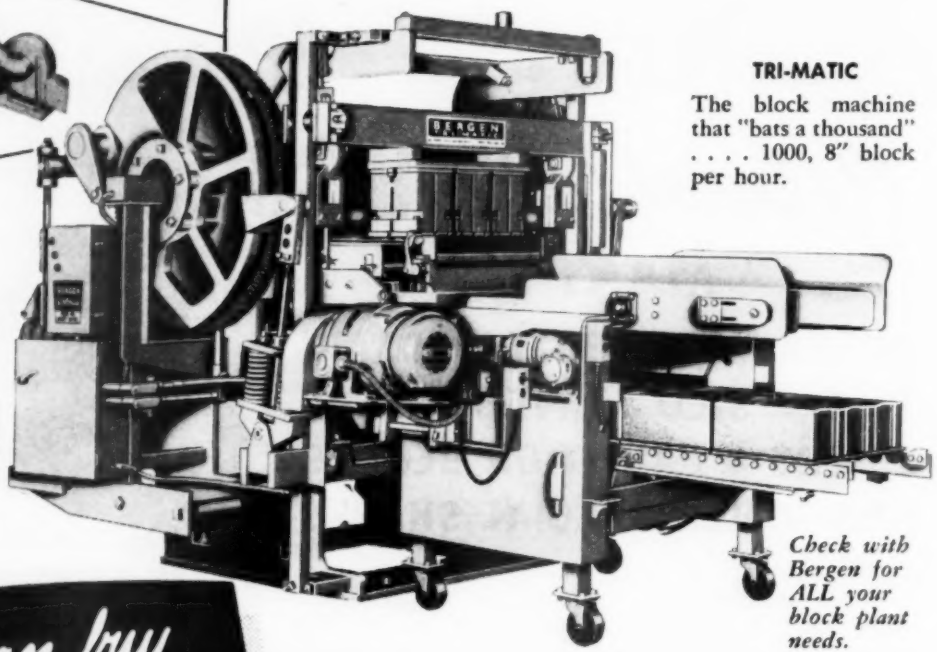


PALLET CLEANER



SKIP HOIST

Perhaps you wonder where Bergen Machine & Tool Company got the "know-how" to produce so many improvements on current machine and mixer parts, as well as completely new items of equipment. The answer lies in their THIRTY-THREE years of experience in making block, in plants under interlocking management. The four block plants associated with them have a combined output of OVER 20,000,000 block (8″ equivalent) annually, and provide them with the most perfect "testing laboratory" for new ideas. The folks at Bergen are truly block experts who recognize possibilities for more efficient parts and know how to design them for longer life.



TRI-MATIC

The block machine that "bats a thousand" . . . . 1000, 8″ block per hour.

Check with Bergen for ALL your block plant needs.

You can buy from Bergen with confidence

BERGEN MACHINE & TOOL CO., INC.
NUTLEY, NEW JERSEY

•

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CONSTRUCTION EQUIPMENT CO., LTD.
404 OLD WESTON ROAD, TORONTO
Offices in HALIFAX, MONTREAL, LONDON and EDMONTON

Your Profit Starts With the First Cut!

Clipper "SAILS RIGHT THRU" SAWS & BLADES

. . . and FREE TRIAL Guarantees it! . . .

MADE BY THE ORIGINATORS!

Clipper made the World's FIRST Masonry Saw nearly 20 years ago . . . still makes the World's FINEST Saws and Blades for every Masonry and Concrete cutting job

OTHER PATENTED CLIPPER FEATURES

PRESSURE EQUALIZER

Cushions pressure, cutting hard or soft materials. Gives fast cuts and long blade life.

WET or DRY PUMP

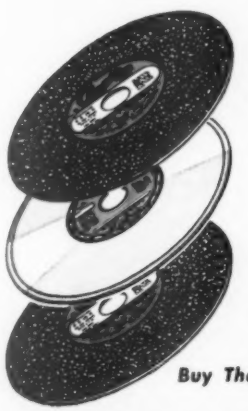
Factory Sealed Pump changes Dry Cutting to Wet by turning a valve. Needs no maintenance—no belts to remove.

LOOK for the NOTCHES AND THE BRIGHT ORANGE COLOR

Clipper

SIMPLE in operation
RUGGED in construction
DEPENDABLE in performance

BE SURE — BUY CLIPPER! Patented "SELECT-A-NOTCH" gives instant, positive height adjustment for cutting Quarry Tile, Concrete Block or Stone. Clipper's exclusive deep-seating NOTCHES guarantee true Cutting Head alignment—for maximum blade life . . . increased production.



You Can Depend On
CLIPPER BLADES for CONSISTENT QUALITY From Rim to Stub!

SPECIFY GENUINE CLIPPER—and take the gamble out of Blade buying! Nearly 20 years of field and laboratory research PLUS rigid manufacturing controls is your assurance of Consistent Quality in every genuine Clipper Blade. A complete range of specifications for low cost, faster cuts in all types of Masonry Materials, Asphalt and Concrete.

Clipper "Wet" or "Dry" Abrasive Blades
Clipper Diamond Blades
Clipper Break-Resistant (CBR) Blades

Buy Them By The Case for Greater Savings!

Saw CONCRETE or ASPHALT with the new . . .

Clipper ConSawMatic

25 H. P. SELF-PROPELLED

Exclusive 3-Point Suspension on rugged 4-wheel chassis — eliminates binding — reduces blade wear. Improved Screw Feed — for positive Depth Control. The new Clipper "ConSawMatic" with EVERY feature demanded of a saw — cuts more concrete at lowest cost per foot.

MODEL C-250

One of 6 models—Priced from $465

4 OUT OF 5 BUY CLIPPER

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No. 102

FACTORIES IN ENGLAND AND FRANCE

FREE TRIAL

Your ONLY Guarantee of Complete Satisfaction—Actual on-the-job test!

MR. CLIPPER

Collecting 100 lb. samples

Handling at laboratory

Slump test

Kelly ball test

Molding cylinders

Capping cylinders

5000-test study of standard truck mixers preceded increase in capacity

Standards of the National Ready Mixed Concrete Association now provide that the volume of the batch in standard truck mixers may be increased to 10% over the normal rated capacity of 57.5% of drum volume, provided this increase is guaranteed by the manufacturer and the normal minimum of 50 mixing revolutions is increased to 70.

In the correlated new standards of the Truck Mixer Manufacturers Bureau, this 10% increase is represented by the manufacturer's guarantee to mix an additional ½ cubic yard over rated capacity in all mixers of 2½ cubic yards or larger size.

This revision is based on long industry experience, substantiated by the study of truck mixers conducted at the University of Maryland, in 1952, reported by Stanton Walker and D. L. Bloem, respectively Director and Assistant Director of Engineering of the NRMCA. This study, the most extensive ever made, involved 2000 cylinders, 600 slump tests, 1000 Kelly Ball tests, 300 wash tests and 1200 sieve analyses—a total of 5100 tests.

A composite copy of the resulting NRMCA and Bureau revised standards, together with ASTM standards, is now available to all architects and engineers who wish to incorporate them in their own ready mixed concrete specifications.

Address the TRUCK MIXER MANUFACTURERS BUREAU, 1325 E Street, N.W., Washington 4, D.C.

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CHAIN BELT COMPANY
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WORTHINGTON CORPORATION
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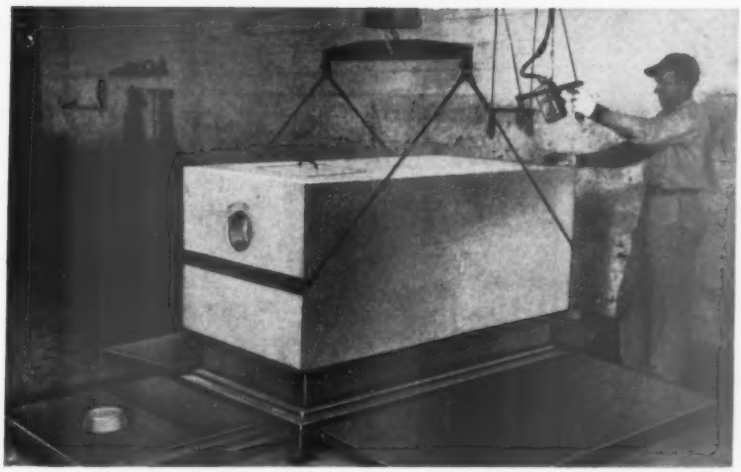
Concrete Septic Tanks Increase Your Profits



Low Production Costs

with

Thomas Steel Forms

- *Self-Aligning*
- *Self-Assembling*

Most concrete product manufacturers are looking for kindred lines . . . Products which can be manufactured with present overhead and labor, without interrupting existing production schedules . . . That's where we fit into your picture.

You can share in this high profit concrete Septic Tank business with a small investment in Long Lasting, High Production Thomas Steel Forms. Perfect Forms engineered to produce perfect Septic Tanks which far exceeds today's standards of quality at a fraction of present direct costs.

- **Beat all price competition**
- **Produce better looking tanks**
- **Build more tanks per form**
- **Less non-productive labor**

BOLSTER YOUR PROFIT TEAM

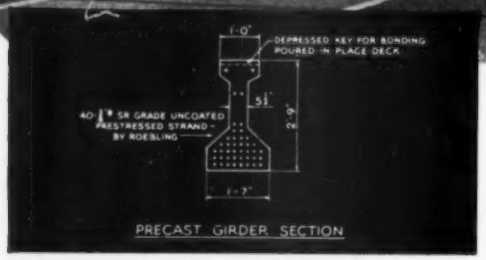
Get complete details now. Write, wire or phone

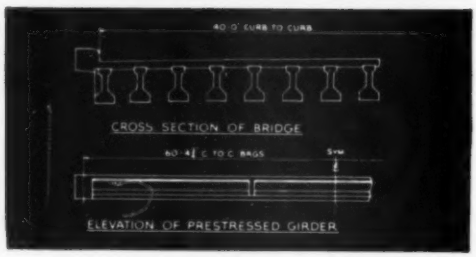
***Thomas* Steel Forms**

25257 W. Eight Mile Rd. Detroit 19, Michigan

NOW! 8 PRESTRESSED CONCRETE BRIDGES FOR NEW JERSEY'S GARDEN STATE PARKWAY

Being lifted into place is one of the prestressed concrete girders produced by The Formigli Corporation. Overpass spans vary from 40 to 60 feet.





General view of the Formigli 320-foot prestressed concrete casting bed. At right are inverted "T" girders awaiting delivery.

THE FORMIGLI CORPORATION, Berlin, N. J. recently cast prestressed concrete beams for eight overpasses* on Section 11 of the Garden State Parkway near Atlantic City. Production in the 320-foot casting bed was 160 linear feet of prestressed members per day – the pouring being done on one day and the steam curing on the next. The tensioning elements were Roebling 3/8-inch diameter, 7-wire stress-relieved Prestressed Concrete Strands and the maximum initial prestressing force was 240 tons.

For years, The Formigli Corporation has produced precast concrete members. To broaden its market, the pretensioning bed and post-tensioning system were added recently, and the Garden State Parkway job was its first in the pretensioned field. Prospective business includes prestressed building girders, floor and roof deck members, and spans beyond the reach of the Corporation's well-established line of precast reinforced members.

Roebling engineers, who have pioneered in the development of prestressing techniques and tensioning elements in America, are always ready to offer suggestions to help assure best results on any specific prestressed concrete applications. Write Construction Materials Division, John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

*Designed by Gannett Fleming Corddry & Carpenter, Inc., Harrisburg, Pa.; General Contractors, A. J. Groves & Sons Co., Minneapolis, Minn.

ROEBLING

Subsidiary of The Colorado Fuel and Iron Corporation

Complete CONCRETE PLANT SERVICE

by

"Fanning Schuett"

Concrete Plants
Designed, Fabricated
and Erected
under ONE Contract

CENTRAL MIX TYPE CONCRETE PLANT

of C. & W. H. Corson — Plymouth Meeting, Pa.

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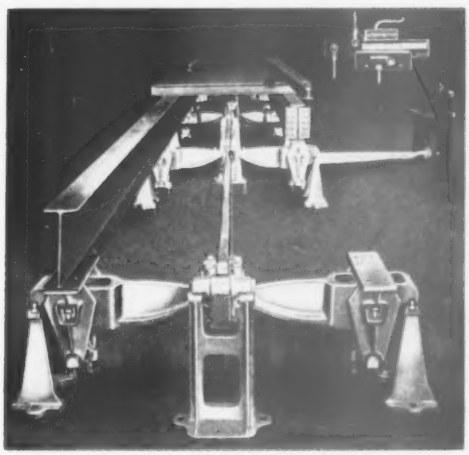
- Belt conveyor is 24" x 240'
- Mixer carried on separate concrete piers

CEMENT STORAGE BINS

in highway construction plant of contractor. Steel bins, of 400 bbls. each, are shipped completely assembled and welded, ready to lift up in one piece. Screw Conveyor arranged for re-circulation.



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218 Precast, Prestressed Deck Girders, with Spans up to 63', Factory-made for Garden State Parkway Bridges

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Factory-made, prestressed deck girders, 218 in number, up to 63 ft. in length, for eight bridges on New Jersey's Garden State Parkway, highlight this trend. Designed by GANNETT FLEMING CORDDRY & CARPENTER, INC., Harrisburg, Pa. and manufactured by FORMIGLI ARCHITECTURAL STONE CO., Williamstown Junction, N. J., every member is field practical, for fast erection with minimum supervision.

Cost in place invites comparison . . . inherent resistance to fire, weather, rust and rot, with no painting and little or no maintenance, mean further economies . . . marking the coming of age of concrete prefabrication.

For school and residential, commercial and industrial construction, factory-made concrete columns, spandrel beams, girders, roof slabs, provide fire-safety, structural stability and pleasing appearance of concrete, at marked cost advantage.

ASSEMBLY-LINE METHODS speed production in 320'-long pretensioning bench at Formigli's Williamstown Jct., N. J. plant, where 5 bridge deck girders were cast at a time and steam-cured. Facia members were post-tensioned at Formigli's Berlin, N. J. plant. 'INCOR'* 24-HOUR CEMENT produced 4000 psi stripping strength in 18 hours, setting tempo of operation, assuring maximum output at minimum production cost . . . with high ultimate strength and durability, hallmarks of America's FIRST high early strength portland cement. *Reg. U.S. Pat. Off.

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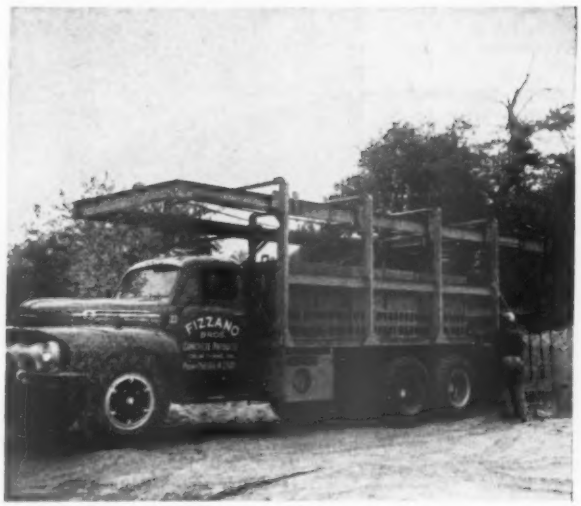


Unloading cubed block from truck

Push-button controls are at rear of truck

Speeding Up Block Deliveries

Fizzano Bros., Inc., Crum Lynne, Penn., sell both ready-mixed concrete and concrete block. Use special handling equipment

By WALTER B. LENHART

AT CRUM LYNNE, PENN., a suburb south of Philadelphia, near Chester, is the concrete masonry plant and offices of Fizzano Bros., Inc. The plant, which has been in operation for 17 years, features the use of two No. 15 Stearns machines. Recently the company purchased the Wilmington Service Block and Supply Co. at Wilmington, Del. This operation has a Besser Vibrapac equipped with an Oswald height and density control system.

In addition to handling a general line of building supplies, the company has a batching plant and two mixer trucks. The company was practically forced into the ready-mixed concrete business because many of its jobs using concrete block were held up and delayed because of ready-mixed concrete deliveries.

High temperature steam curing (180 deg. F.) is used, and the company specializes in cinder and air-cooled slag concrete masonry units. The plant uses Heltzel weigh batchers, bins and bulk cement handling equipment. The aggregate conveyors were supplied by Fanning Schuett Engineering Co. Three Towmotors and a Champion masonry saw are part of the equipment and a franchise for the Split-Rock block splitter for the area is held by the company.

One of the interesting features of Fizzano Bros., Inc., operation is the use of the Bros Lectro-Lift loading and unloading equipment. The illustrations show a load that happened to be ready for the road at the time of the author's visit. It is a Model 8CS18 mounted on a Ford truck with 8 ft. wide bed. The truck was carrying a mixed load, and the total elapsed time for the haul, unloading, and back to the plant was about 40 min. In actual practice, at the Fizzano operation, a truck like the one shown makes a delivery every hour. Short hauls are made in less time; longer hauls in a longer time, but the truck averages out as indicated. Fizzano Bros., Inc. are distributors for Bros equipment in Pennsylvania and adjoining states.

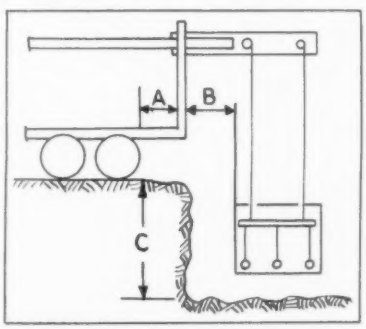


Diagram showing dimensions required in fitting unloading equipment to truck chassis. (A) Distance from edge of tire to end of bed varies with truck and Lectro-Lift body and may be from 4 to 6 in. (B) Distance from end of body to edge of load is 21 in. with 18-in. block and 24 in with 16-in. block. (C) Maximum unloading depth below ground level is 8 ft.

At the yard, block are placed on the floor, cubed, and in loading position so that split loads can be gathered to one point. The truck with the Bros loader then backs up to the pile, and the lone operator loads his own truck.

The Lectro-Lift utilizes a skeleton-like structural steel frame, mounted on a truck bed, and is provided with an electrically operated travelling carriage and hoist equipment. Power for the unit is derived from a self-starting, twin-cylinder, air-cooled engine that drives a 3-phase generator. Push button controls are located near the rear of the truck for convenience. Limit switches control maximum travel and lift so that one man can easily load and unload the masonry units.

The hoist lifts at the speed of 8 f.p.m. with the carriage travelling at the speed of 24½ f.p.m. An experienced operator can readily unload 432 standard 8's in 8 min., and on the longer beds, unload 576 standard 8's or equivalents in 12 min.

The Lectro-Lift body is made in four sizes. All sizes are for beds 8 ft. wide, in lengths of 12, 14, 16 and 18 ft. and in special cases up to 32 ft. The 12-ft. and the 16-ft. beds are recommended for plants that stress 16-in. block and the 14-ft. and 18-ft. beds for plants that are making mostly

One of two high-capacity block machines

18-in. block. The dimensions of the cube lifted for the 12 and 16-ft. bed, are 64 in. wide, 48 in. deep and up to 58 in. high, and for the 14 and 18-ft. beds the cubes are 72 in. wide, 54 in. deep and up to 50 in. high. The maximum weight is 6000 lb. Bodies can be provided, it was said, to lift loads up to 80 in. wide, but when unloading or loading on a side slope, side rubbing is experienced. The company now operates four Lectro-Lifts.

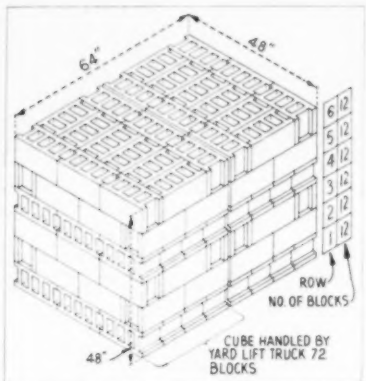
Some tabulated data relating to the delivery cost using the Lectro-Lift are:

For a trip of 5 miles (10 miles round trip)		
8 x 12 x 16 in. and 8 x 12 x 18 in.	1.48/100 cents	1.13/100 cents
8 x 8 x 16 in. and 8 x 8 x 18 in.	95/100 cents	9/10 cents
8 x 6 x 16 in. and 8 x 6 x 18 in.	7/10 cents	67/100 cents
8 x 4 x 16 in. and 8 x 4 x 18 in.	7/10 cents	67/100 cents
Concrete brick—per 1000 brick—palletized	$1.13	$1.07
For a trip of 10 miles (20 miles round trip)		
8 x 12 x 16 in. and 8 x 12 x 18 in.	2.9/100 cents	1.91/100 cents
8 x 8 x 16 in. and 8 x 8 x 18 in.	1⅛ cents	1¼ cents
8 x 6 x 16 in. and 8 x 6 x 18 in.	1 cents	92/100 cents
8 x 4 x 16 in. and 8 x 4 x 18 in.	1 cents	92/100 cents
Concrete brick—per 1000 brick—palletized	$1.60	$1.50

The above tabulation does not take into consideration savings due to damaged block, for if the block are loaded unchipped they can be unloaded unchipped.

The line sketch gives some of the design characteristics.

The method of cubing the block for loading and unloading with the lifting device will vary with the size of the block being cubed. The line sketch is for heavy aggregate, standard 8- x 8- x 16-in. block that weigh in the 40-lb. range, making a 144-block cube. If lighter block are made, a row can be added; if heavier, one row can be left off so as to make a cube of 168



Showing how block are cubed. Yard lift trucks handle 72 block and Lectro-Lift handles cube of 144 block

and 120 block, respectively. Interlocking of the block is usually recommended.

John Fizzano is president of the company, Anthony Fizzano is secretary and Thomas Fizzano, treasurer.

Modern office and plant where concrete products and ready-mixed concrete are produced

Concrete block for use in both cavity walls and reinforced concrete block walls. Webs, opposite core openings in the slabs, are 3 in. high; vertical section through them at center is only 8.7 percent of face area of block, allowing less transmission of moisture and cold

Cavity and Reinforced Concrete Block Walls

THE ACCOMPANYING ILLUSTRATION shows a relatively new concrete block (see ROCK PRODUCTS, October, 1953 issue, p. 209), which reportedly can be used to make both cavity walls and reinforced concrete block walls. The block is integrally cast and tests 1757 p.s.i., comprising 75 percent cinders, 25 percent sand, and an aggregate-to-cement ratio of 7:1. According to Morris Lapidus, Brooklyn, N. Y., inventor of the block, the insulation value is the same as for the standard cavity wall, while the cost of the wall, in place, is considerably less since only one wall, instead of two, is erected. No furring or lath is said to be required. Conduit and piping are accommodated in both vertical and horizontal directions in the cavity.

The block may serve as a bond beam and may also accommodate a reinforcing bar, or two angles, to make a lintel. It reportedly builds dry foundation walls, being stronger, laterally, when laid up as a wall, than conventional block. If reinforced, it can be used for larger structures and retaining walls.

Large Concrete Tanks

MCFADDEN SEPTIC TANK SERVICE CO., INC., Grand Rapids, Mich., recently began production of 750-gal.-capacity, precast-concrete septic tanks, reportedly the largest ever precast on a production basis. The tanks are cast in a single concrete unit, including the cover. The company also produces 550-gal. septic tanks and precast concrete well pits and water meter pits.

Specializing in

PRECAST Concrete

Pre-Cast Corp., Miami, Fla., produces a diversified line of concrete units from window and air-conditioner frames to large precast, prestressed structural members for schools, and bridges

By C. E. WRIGHT

Prestressed concrete arch beams for school being erected. They are cast in two sections and bolted together at the apex

A PRECAST CONCRETE SPECIALTY manufacturing business which employs 250 workers and utilizes 3½ acres of ground, with an additional 10 acres soon to be put to the same use, has been built up in the Miami, Fla., area. For many years concrete has been gradually displacing other types of construction material, largely because of its low cost and its protection against termites and rot, both highly prevalent in that semi-tropical climate.

This highly successful business is the Pre-Cast Corporation, headed by Jack Plunkett, with the plant and office in Miami, adjoining Coral Gables, where the original operation started in 1936. Its biggest success has come with the expansion of its lines of concrete specialties, but it is now branching out into prestressed concrete, which represents about one percent of its sales.

Jack Plunkett, president of Pre-Cast Corporation, attributes a considerable part of the company's success to the natural advantages of concrete for the Florida climate, but also in equal measure to a sales promotion program which constantly stresses that concrete is comparable in cost to wood and other building materials and lasts longer.

Here's an incident that illustrates this point. An employe of the company bought a home in a new development in the Miami area. The porches of these homes had wood supports. Within less than a year many of these wood supports had rotted. The Pre-Cast employe replaced the wood supports with precast concrete columns. Within a short time nearly all of the other residents in this development followed suit. Here was a strong selling argument that could be used with other home builders in favor of concrete for such purposes.

With the boom in sales of room air conditioners, Pre-Cast Corporation saw an opportunity for mass production of a universal concrete open-sided frame which could be set in the masonry of a home or apartment building. These are sold to builders or home owners at a delivered price of $7 each. The masonry work for installation is extra, of course, but still figures out much lower than the $30 to $40 charged for installation in a window. Many of the newer apartment houses in the Miami area have installed these concrete frames during construction. The hole is blocked with plywood, which easily can be removed if the occupant wants to install an air conditioner or left in if he doesn't. Sales of these have been in the hundreds, and they have become a standard item.

Diversity of Products

Among the fastest selling items in the Pre-Cast line are louvres for enclosing patios and garages. These are decorative, easy to install, and economical, while at the same time giving light and air and a degree of privacy. A representative of ROCK PRODUCTS who recently visited the plant was driven down a residential street in Coral Gables where nearly every home had these louvres concealing porch or garage or both. They have almost sold themselves because their presence on so many houses is a self-advertisment.

The original item of Pre-Cast Corporation, and still one of its largest volume items, is a concrete window frame. Most of the other items have developed from the experience gained in that line. A combination window frame and panel has been a natural outgrowth of the window frame business. A standard size is a 4- x 6-ft. window with a 3- x 6-ft. panel, cast all in one piece, which has enjoyed a big demand for homes and motels of standard design. They also have been used in school construction. The company's success in selling these sections is its ability to prove that they can be precast and installed for less money than pouring in place. Moreover, there is no waiting time and the job proceeds faster. This argument also has been used effectively in the sale of precast floor and roof slabs, with the further advantage that the slab is finished when installed. Curtain walls are also an important item of manufacture.

Not all the window frame business is in new construction. Weather conditions in the Miami area are hard on wood, so replacements are a considerable item. Pre-Cast Corporation recently installed concrete window frames in 15 older houses built at the same time where rot had got in its work in relatively short order. At present it is replacing windows in a restaurant, hotel, and water front public buildings.

Exterior wall panels of precast concrete, which were introduced in the Miami area about two years ago, have become part of the company's line of products. It is now installing these panels, which are 8 ft. wide, 4 ft. high, and interlocked and bolted to the wall, in the new Miami office building of International Business Machines. These panels have a waterproof finish of white cement and silica sand mixed with Chattahoochee (round) gravel.

Concrete fencing is another product which the plant is making to capacity.

Posts and rails can be sold at the same price as wood. Though installation costs are a little higher, the longer life of concrete fencing is an offsetting factor. Posts are made in standard sizes, 4- x 4-in., 4- x 6-in., 6- x 6-in., 6- x 8-in., and 8- x 8-in. The posts are made to receive 2- x 6-in. or 4- x 4-in. diamond shaped rails or fence wire. The company is experimenting with a solid precast light wall fence, designed to resemble a wood fence.

Prestressed Products

Other good selling items are interlocking panels for swimming pools; bench ends for the Miami Park Department and for an advertising agency, and solid curb sections, priced at $5 each, which have been sold by the thousands for parking lots, motels and other places where cars are parked.

Although prestressed concrete is still an infant item, the company takes pride in a job recently completed comprising a 63-ft. bridge. The Freyssinet system of prestressing is used, with steel forms for all production items. The company also has precast 50-ft. high arch beams for the George Washington Carver School in Miami. These were formed in two sections and bolted together at the apex.

There has been little breakage of any of the products, a fact attributed to the quality concrete used. An eight-bag mix of standard cement with ½ and ¾-in. locally selected aggregate is used.

Pre-Cast Corporation produces an average of 1 cu. yd. of concrete every 10 min. during its working day, and the concrete is discharged into window molds through rubber hose and is transported to the beams and specialty items in hoppers mounted on fork lift trucks. When the volume of work is in excess of the capacity of the batching plant, ready-mixed concrete is obtained from nearby sources.

The Pre-Cast Corporation's selling program is directed toward contractors primarily, though sales are made to home owners, particularly in the case of replacements. Jack Plunkett says his best results come from being able to prove the comparable costs and superiority of precast concrete over wood and other materials, and the time saving over pouring in place.

typical mix designs for lightweight Perlite insulating concrete

†Dry Concrete Properties						Mix Proportion by Volume				Field Tests	Materials Required For One Cubic Yard of Perlite Concrete†			
* oven dry density (lb per cu ft)	* compressive strength (psi at 28 days)	** thermal conductivity "k"	* coefficient of thermal expansion (per unit per °F)	* tensile strength (psi at 28 days)	* bond strength to steel (psi at 28 days)	* modulus of elasticity in compression (psi at 28 days)	cement (sacks)	Perlite (cu ft)	water (gal per sack cement)	air entraining agent *** (pints)	†† wet density as poured (lb per cu ft)	cement (sacks)	Perlite (cu ft)	water (gal)	air entraining agent *** (pints)
36	440	0.77	0.0000061	75	83	248,000	1	4	9	1	50½	6.75	27	61	6¾
30½	270	0.64	0.0000055	50	53	158,000	1	5	11	1¼	45½	5.40	27	59½	6¾
27	180	0.58	0.0000048	40	23	120,000	1	6	12	1½	40½	4.50	27	54	6¾
††24	130	0.54	0.0000045	30	—	94,000	1	7	14	1¾	38	3.85	27	54	6¾
22	95	0.51	0.0000043	20	—	69,000	1	8	16	2	36½	3.38	27	54	6¾

* Based on impartial laboratory test data of Robert W. Hunt Co., Engrs. under sponsorship of the Perlite Institute. The average density of the aggregates used was 8.0 lb. per cu. ft. Strength data based on ASTM type 1 Portland cement.
** From report dated April 8, 1953, of Armour Research Foundation of Illinois Institute of Technology.
***Available from Perlite Institute members.
† All data herein subject to modification due to type and size of mixer used and other variable job conditions.
†† All data for this density is interpolated.

Perlite Concrete Specifications

THE PERLITE INSTITUTE recently released a revised mix design chart for perlite concrete, containing new data for the design of perlite roof deck insulation, lightweight floor fill and precast slabs and block.

The new mix design information is part of a specification for perlite concrete recently adopted by the 49 perlite-producing members. A separate specification for the mixing and placement of perlite concrete roof deck insulation, which is approved for use under bonded built-up roofing, has also been established.

Both new specifications are based on data developed in a comprehensive physical testing program conducted by the Robert W. Hunt Co., Engineers, and thermal conductivity values determined by the Armour Research Foundation of Illinois Institute of Technology.

Copies of the specifications may be secured from the Perlite Institute at 10 E. 40th St., New York 16, N. Y., or from member companies.

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WINGES MIXED CONCRETE CO., Lexington, Ky., was recently incorporated with 2000 shares of stock, no par value. The incorporators are L. M. Winges, G. M. Robertson and Bernadine Winges.

Slump Brick

CINDER CONCRETE PRODUCTS, Kansas City, Mo., has increased its production of "slump" brick for use as trim or regular facing work. The company started producing slump brick about two years ago and, according to L. R. Weston, general manager, the demand has recently increased so sharply that it was necessary to step up production methods in order to meet the extra demand. The brick, in 4- x 2- x 12-in. and 4- x 2- x 16-in. sizes, are produced on a special machine designed at the company's own plant. The company also produces cinder block, "Clalite" lightweight aggregate block and sand and limestone block.

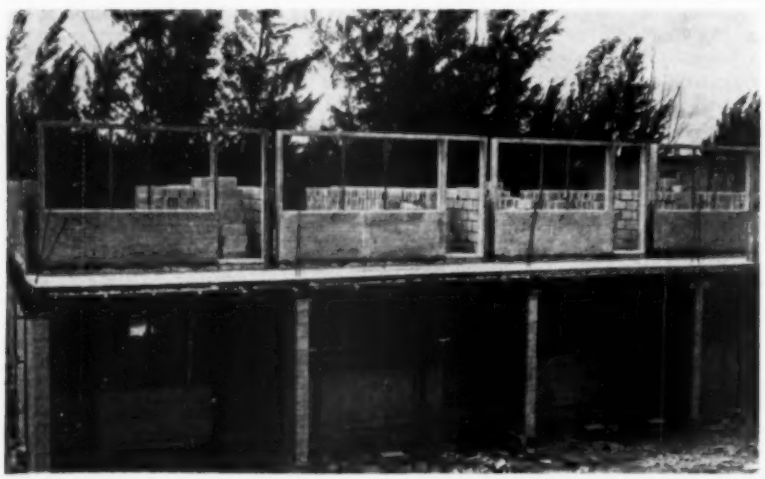
Israel Pipe Plant

LOCK JOINT PIPE CO., East Orange, N. J., recently completed construction of a concrete pipe plant in Israel. The plant, built at a cost of $1,600,000 and said to be the world's largest, will produce concrete pipe to give Israel a vitally-needed water supply system. According to Hendrik van Renssalaer, vice-president, the company also plans to build two additional plants in Israel, costing about $250,000.

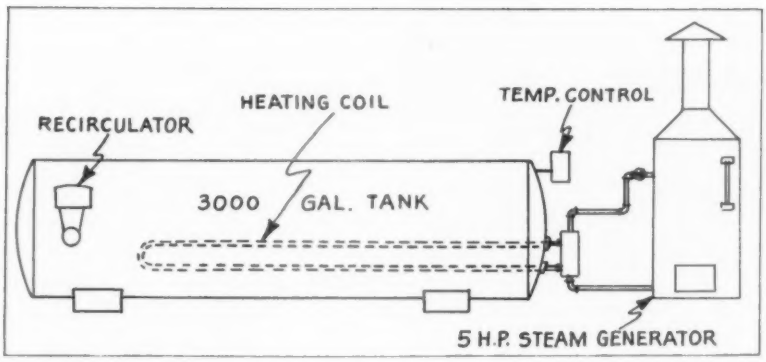
•

TIPTON READY MIX CO., Tipton, Iowa, has been incorporated by Herbert L. Morehead, Jr., Nelle A. Morehead and Herbert L. Morehead, Jr., all of Cedar Rapids, Iowa, and who also operate Stanwood Ready Mix Co., Stanwood, Iowa, and Morehead Construction Co., Cedar Rapids.

MODERN CRETE PRODUCTION CO., Kenova, W. Va., has been incorporated by Charles A. Kinder, Walter L. Varney and Charles A. Darnell. Capitalization was listed at $50,000.



Window and door frames and panels, cast in one piece, being installed in a motel



Sketch of general layout of hot water heating system for ready-mixed concrete plants

Hot Water Heating System for Ready-Mixed Concrete Plants

By WILLIAM J. SHORE*

TRENDS IN READY-MIXED CONCRETE operations indicate a definite demand for the supply of heated aggregates during the cold weather period.

Many plants now furnish and deliver hot aggregates and hot water for the mixing. Generally this operation is carried out in a hit or miss fashion, and where requirements and demands are large, as for example, the delivery of 100 cu. yd. of mix in one hour, usually at the start of a day's operation, the steam generating system required to make enough hot water is substantial in size and costly to install. Some companies have boilers of 100-hp. capacity to do this work.

In this industry, the demand for aggregates is usually concentrated during the first hour's operation. This is understandable, since the business of pouring concrete begins when men start work at 8 a.m., and allows them to have sufficient time during the remainder of the day to finish and complete operations on the mix that has been poured into place. For an operator that must deliver about 100 cu. yd. during the first hour's operation, the heating of water required for the mix is a substantial task when regarded in terms of required boiler horsepower.

If we assume that water is heated by putting a steam nozzle into the truck tank, and turning steam directly into the water that is in the tank, the following conditions apply.

Assuming water in the tanks is at 45 deg. F. and it is desired to raise its temperature to 145 deg. F., a rise of 100 deg., it will require somewhat over 1 B.t.u. for each deg. rise in temperature per pound of water. We assume that for a delivery of 100 cu. yd. we will require 3000 gal. of water. Without going into too much detail, to accomplish this rise in temperature we must put in a total of 3,600,000 B.t.u. in one hour. The nearest size standard boiler to deliver this amount of heat is a 100-hp. boiler that can supply 3,347,500 B.t.u. per hour, and which will meet the requirement. The complete cost of installation of one 100-hp. boiler with enclosure, fuel equipment, foundation, stack and all controls and etc. is approximately $12,500. Up to now, this has been the standard method for producing hot water. There is a better and far less costly way to accomplish the same result.

*Shore Engineering, New York, N.Y.

Large Quantities of Hot Water

There is nothing new or original about this method, but the fact that it is so seldom used in ready-mixed concrete plants indicates that few in the industry are aware of its many advantages.

The elements that comprise this system for heating hot water are:—

(a) A small steam generator, (in this case 5 hp.)

(b) A storage tank to hold 3000 gal. of water.

(c) A copper heating coil, temperature regulator and recirculator.

The principle on which this system operates is indeed simple. In this system, the boiler operates continuously 24 hr. per day.

As shown before, there are required 3000 gal. of water that must be heated up to 145 deg. F. This requires a total delivery of 3,600,000 B.t.u. Since the boiler operates 24 hours, the number of B.t.u.'s required per hour are 3,600,000 divided by 24 or 150,000 B.t.u. per hour.

The nearest size boiler to this is a 5-hp. boiler which has an output of 167,375 B.t.u. per hour. This boiler is therefore sufficient to do the same work which formerly required one 100-hp. boiler.

Approximate Installation Costs

Again these are approximate, but the relationship in both instances holds constant.

Cost of 5-hp. boiler completely installed	$ 1,250
Cost of 3000-gal. storage tank	600
Cost of heating coil, temp. control and insulation	400
Total cost of installation	2,250
Previous cost of installation of one 100-hp. boiler	12,500
Saving effected in first cost	$10,250

(In both instances total number of B.t.u. delivered are identical)

Recommendations

In both instances, total heat delivered is the same, except that in one instance it was done over a period of one hour, in the other, it took place over 24 hours.

Cost of fuel consumption practically identical.

Saving in cost, slightly over $10,000.

It appears to the writer that manufacturers of ready-mixed concrete plant equipment would do well to take upon themselves the responsibility of showing their customers and patrons better and more effective ways for heating aggregates and water.

Because of this apparent lack of interest in the proper and effective means for heat applications, practically all of the installations now in operation are costly to install, require excessive amounts of fuel, and in general they operate poorly.

When it is realized how manufacturers of block machinery spend great sums of money to promote improvements in use and application of block masonry, the author feels there is indifference to this aspect of the industry. In comparison with the many improvements, highly efficient storage, and delivery and weighing facilities found in all bin systems, the heating end is still in the horse and buggy era.

To Build Cement Silos

TIDEWATER-SHAVER BARGE LINES recently announced plans to build two new silos at Pasco, Wash., for the storage of bulk cement. The silos are part of a $2,000,000 expansion and improvement program.

Left: Showing how form is released by air cylinder. **Center:** Reinforcing in place ready for pouring concrete. **Right:** Assembly of top and bottom sections. Note lifting groove in bottom section

Step Up Septic Tank Manufacture

• Special steel forms and efficient handling equipment increase production for Superior Septic Tank Co.

In August, 1944, the Superior Septic Tank Co. poured its first septic tank with equipment consisting of a small portable cement mixer and a plywood form used for the inside of the tank, the walls of the excavation serving as the outside form. Since then, this Detroit firm has become Michigan's largest concrete septic tank maker.

In November of the same year, new plywood forms were acquired and the first precast tanks produced by this company were poured and delivered by truck to the installation site. Weather controlled production at this time as tanks were poured outside. Five tanks a day were being poured requiring the labor of five men.

Early in 1946 the site of the present plant was purchased and a small building, which served as office, shop and plant, was erected. This eliminated the weather problem thus guaranteeing the company at least a two-tank-a-day, year-round production.

A year later, construction of a building 32- x 80-ft. was completed and equipped, the major equipment being a 2-ton Manning Maxwell travelling crane and a two-bag cement mixer. In 1948, the first steel septic tank forms were put in service.

Expansion continued and in 1950 a 20-cu. yd. Butler feeder bin and a Barber-Greene belt conveyor were added. Increased sales demanded larger production and so the main section, or manufacturing area of the plant, was enlarged to its present size, 32- x 130-ft., the additional 50 ft. having been added in 1953.

Airplane view of plant showing extensive yard storage area

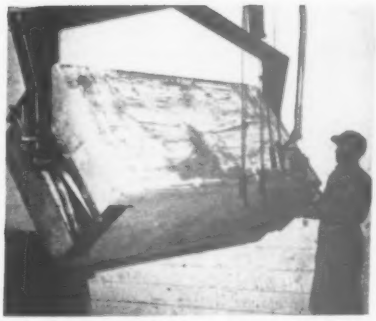
Service Equipment

As expansion progressed through larger manufacturing facilities, the service equipment also changed and improved. The company was continually striving to make equipment as efficient and labor-saving as possible. Such equipment now includes four tandem-axle tank delivery trucks each with a double-drum winch to lift and lower tanks, three trenchers with trailers for transporting them, two backhoes, two Hi-loaders, a bulldozer with truck for hauling it, a dump truck with trailer to supply aggregate to the plant, a dump truck on full time operation supplying stone to the installation crews, two 2-ton installation crew trucks, three pickups and two septic tank cleaning trucks.

All equipment is maintained and all fabricating is done in the company's own shop. From the smallest repair to the most complete major overhaul of all trucks and machines, all can be handled in this shop which is equipped to fabricate any and all special equipment.

Though all pieces of equipment were important to the success of the company, one stood out above all. The type of pouring form used regu-





Left to right: ½-cu. yd. bucket for pouring concrete; opening end (top) to show ease of releasing form and molded-in outlet hole; lift and turn bridle makes it easy to handle tanks

lated the overall cost of operation. The first steel form, though it improved efficiency, was cumbersome and unwieldly and therefore modifications were continually incorporated in an effort to increase production and improve handling conditions. It was these early modifications that laid the foundation for the development of the present-day high efficiency form. The tanks produced are of a monolithic, half-section design, joined in the center by a horizontal ship-lap joint.

Form Design Speeds Production

High production and cost reduction are features of the present form. The tearing down and setting up is accomplished rapidly. The first step in stripping the cured tank is to attach an air hose to a snap coupling secured to the form base. An eccentric post, which is connected to the inside form by a series of draw bars, is actuated by an air cylinder, causing the inside form, which is hinged in the center and ends of each panel, to move in about 3 in. This gives ample clearance for the tank to be raised off the form without friction or drag. The outside form panels are hinged to the base and held in position by a quick release pin in each corner. After the pins have been removed, the panels are easily lowered to the floor.

The bottom half of the tank is poured upside down, requiring turning before final assembly. A special turning device, designed and constructed in the plant maintainence shop, simplifies this type of operation.

A groove cast in each end of the tank by an angle iron secured to the outside end panel, prevents slipping while turning and lifting.

To reassemble the form, the first step after cleaning is coating the panels with Satisol, a Sinclair oil product, designed to reduce surface tension, lubricate and prevent discoloration of concrete. Remembering that the form is still in the same position, the inside section is reassembled by reversing the air pressure on the two-way cylinder. Where air equipment is not available, the same results can be gained by manual operation. To complete assembly, a 4- x 4-in., 12 gauge wire mesh is put in place, the outside panels are raised, the four locking pins are set in, the manhole pan is put in position and reassembly is completed.

(Continued on page 228)

Official personnel of the company, left to right: John P. O'Connell, office manager; Gerald T. Francis, installation supervisor; John G. Francis, Jr., branch manager; and John G. Francis, Sr., president

After the bottom section has been turned and set on the floor, regular cement mortar is applied to the outer lap. The inner lap is covered with an asphalt mastic, thus assuring a watertight seal when assembly is completed. The top section is then set in place using a lightweight cable bridal for lifting. The tank is now ready to be moved to the storage yard for curing. The moving is done by a 3-ton Ross lift truck, also used in loading the delivery trucks.

Line-up of various types of equipment used in manufacture, delivery and servicing of septic tanks

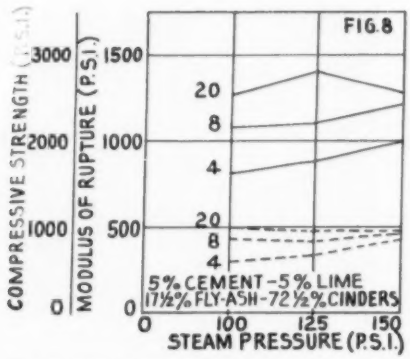


Fig. 8: Lime-cement-flyash curves based on average of 6-8 breaks for each value with excellent reproduceability and no erratic results. Calculated as quicklime

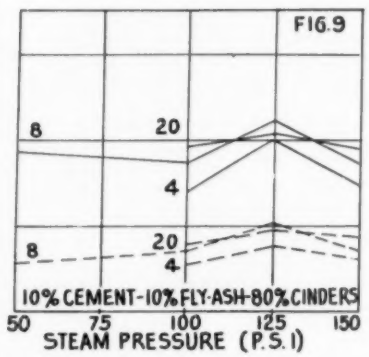


Fig: 9: Cement-flyash curves based on average of 3-4 breaks for each point. No check values and several erratic results. Same cinders used throughout

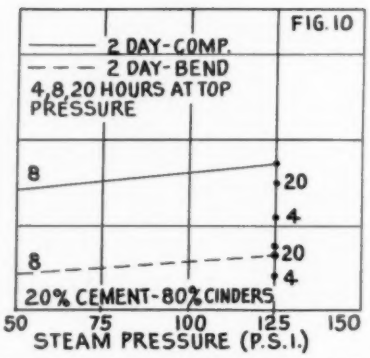


Fig. 10: Straight cement-cinder bars with 3-4 breaks for each value run at 50 and 125 p.s.i. for 8 hr., and at 125 p.s.i. only for 4 and 20-hr. periods

Effect of Steam Pressure and Cycle On

Autoclaved Concrete Products

• Continuation of report on investigations sponsored by National Lime Association and others at the Research Foundation of the University of Toledo, in the May issue of ROCK PRODUCTS

By JOHN K. SELDEN*

IN THE PREVIOUS ARTICLE ON "Lime, Fly Ash, Silica and Cement in Autoclaved Concrete Products" (ROCK PRODUCTS, May 1954), the writer pointed out the meagerness of the technical literature on lime and fly ash in autoclaved concrete products in comparison with that on the more familiar cement silica combination.

Because of this lack, the writer has ventured to include, along with the fairly well substantiated data of Fig. 8, the somewhat more erratic data of Figs. 9 and 10 and the exploratory tests on effect of mixing and vibration time. While not too conclusive, the results suggest interesting possibilities well worthy of further study.

Choice of Autoclaving Pressures

When a prospective autoclaver begins to design his plant, a primary decision to be made is the number of cycles per day he wishes to use each cylinder, and the steam pressure required to give satisfactory strengths and reduction in shrinkage in the full pressure period allowed for each cycle.

The sand-lime brick industry in this country and more recently, the autoclaved concrete masonry industry have standardized on steam pressures of 120 to 150 p.s.i. with the newer plants being designed for the upper limit to insure two complete cycles a day. Some prospective autoclavers who run their block machines only one shift a day may be inquiring whether satisfactory products can not be made in less expensive autoclaves at lower pressures. Other producers running two or more shifts with daily capacities of 24,000 block or more may wish to plan for three and possibly even four cycles a day by installing special equipment and autoclaves designed for pressures of 250 to 300 p.s.i.

Finally, some wishful thinkers ask if autoclaved products can not be made at pressures below 15 p.s.i. so as to avoid the additional costs of licensed boiler operators.

A search of the literature gives little hope of reaching such an extreme objective with ordinary cement silica mixes. P. Clarkson[3] showed that, using a rich mix of high early cement and steaming 1-4 hr. at 30 p.s.i., good early strengths could be obtained but that the products were weaker than properly air cured units and that tensile strength failed to keep pace with compression. Pressures of 5-15 p.s.i. were found to be inferior. No mention was made of using silica flour.

V. B. Pickett[2] obtained 60-70 percent of 7 day moist strength by curing 4 hr. at pressures below 10 p.s.i. Pressures of 10 lb. and over, he found, decreased the strength. Subsequent curing was necessary.

H. Easterly[3] pointed out that accelerated curing at low pressures did not take the place of regular autoclaving for reduction of volume change, and that Pickett's rapid heating without preset would produce "dead block."

R. P. Havlik[4], using the coarser cements of half a century ago, in 1:4 cement sand mixes, obtained 28-day moist strengths in 24 hr. with 2 lb. steam but reached three times this value or twice the six-month strength when the steam pressure was increased to 80 lb. for 24 hr.

C. A. Menzel[5] (See curve 11) shows that with neat cement-silica pastes it takes 20 hr. at 50 lb. to equal 4 hr. at 120 lb. or 40 hr. at 50 lb. to equal 8 hr. at 120 lb.

All of the above results indicate that low pressure autoclaving of ordinary cement-sand or cement-silica mixes fails to give values approaching those of standard autoclaving at 120-150 p.s.i. and suggest that some other solution to reduction of autoclaving pressures or times should be sought.

The surprising claim in the patent literature that, highly compressed lime-fly ash products can be satisfactorily cured at 50 lb. steam pressure[6] and that lime-shale products can be indurated at pressures below 15 p.s.i.[7] suggests that some formulation with

*Research Foundation of the University of Toledo.

lime or lime and cement may be found to give satisfactory results at pressures lower than those required for cement-silica products.

In the direction of higher pressures, little pertinent data is to be found. Some of the newest European sand-lime brick plants operate at 250 p.s.i. to cut full pressure time in half. Certain industries in this country producing premium type calcium silicates also use 250 lb. autoclaves. Much of the data in the literature on higher pressures was developed in a search for an accelerated method of predicting 28-day strengths of moist cured concrete[8] and was based on mixes which failed to provide adequate reactive silica. Other investigations have shown that steam pressures over 150 p.s.i. may be of no advantage, or even detrimental except for very short curing periods when ordinary mixes are used[9]. Here again, the meager information suggests that high-lime mixes may offer the best medium for realizing rapid induration at higher than usual pressures, particularly for premium products.

Pending further research, the 100 to 150 p.s.i. range is the safest.

Research at Toledo

With a view toward establishing the interrelationship between steam pressure, time at full pressure and resulting strength with lime, cement, fly ash mixes, the following cinder bar series was run at the Research Foundation of the University of Toledo as part of the National Lime Association Fellowship.

The 2- x 2- x 10-in. bars were, as in the previous article, hand mixed in small batches, and molded in six at a time steel gang molds by hand tamping followed by vibration on a Syntron table. After 24 hr. moist curing in the molds, bars were stripped and sealed in a 12- x 72-in. pipe autoclave, electrically heated under the dammed water portion. Approximately 3 hr. were required to bring the steam up to 353 deg. F. (125 p.s.i. gauge) where it was maintained by thermostatic control. Steam was blown off manually after the 4-hr. curing period in ½ to 1 hr., but the insulated cylinder was allowed to cool off naturally after the 8- and 20-hr. periods once the electric clock turned off the heat at night, thus giving the longer cycles the advantages of a little extra curing.

To avoid errors from mixing separate batches for each of the three curing periods, 12 bars were made from one batch and steamed at once. Four were removed after 4 hr., four more after 8 hr. and the last four after a total of 20 hr. at full temperature and pressure. The unavoidable interruption of 8 and 20-hr. curing periods for intermediate opening of the autoclave introduced, of course, another possible source of error.

Two days after molding, bars were broken first as beams with center point loading for flexural or bending strength and then as modified cubes for compressive strength. Unlike the mix-variable bars, discussed in the previous article, which were all made with sand, the steaming-variable bars in this article were all made with cinders.

Data and Curves

The mixes for Fig. 8 were made on a weight basis with 5 percent cement, 5 percent lime as quicklime (one-third added for hydrate) and 90 percent fly ash plus cinders. Four proportions were used originally as follows:

TABLE III—Effect of Varying Fly Ash: Cinder Ratio, Lime, Cement Constant

Batch No.	Lime	Cement	Fly Ash	Cinders	Grand Average Strength % of 7 & 8 Average
7	5%	5%	15%	75%	100%
8	5%	5%	20%	70%	100%
9	5%	5%	25%	65%	99%
10	5%	5%	30%	60%	85%

Due to the remarkably close agreement between batches 7 and 8 and to the undesirability of excessive fines, Fig. 8 was plotted as a composite curve for mixes 7 and 8 and captioned as 5 percent cement, 5 percent lime, 17½ percent fly ash, 72½ percent cinders. Each point is therefore the average of 6-8 breaks with an average mean variation of less than 2 percent between the 15 percent and 20 percent fly ash mixes. The results therefore should be fairly reliable. Batch 9 with 25 percent fly ash gave practically identical strengths at 100 p.s.i. and was only 6 percent lower at 125 p.s.i., thus giving a triple check.

Fig. 9, based on 10 percent cement, 10 percent fly ash and 80 percent cinders with no lime, shows effect of pressures at 50, 100, 125, and 150 p.s.i., while Fig. 10 shows a few spotty results with 20 percent cement and no fly ash. Plotted on the basis of 3-4 breaks per point, they are included only because of the scarcity of data on autoclaved fly ash mixes and the relevance to the low pressure problem.

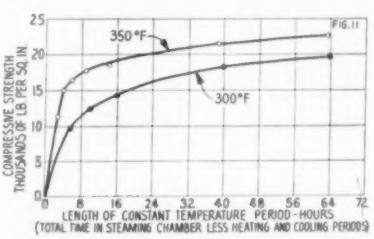


Fig. 11: Reproduction of C. A. Menzel's curve for 2-in. cube strengths of neat cement pastes with optimum percentages of replacement by 0-200 sieve silica

Fig. 11 is a reproduction of C. A. Menzel's[5] well-known curve for 2-in. cube strengths of neat cement pastes with optimum percentages of replacement by 0-200 sieve silica. These curves have been introduced by permission to show the effect of duration of steaming at top pressures of 48 p.s.i. (300 deg. F.) and 120 p.s.i. (350 deg. F.) on the more familiar cement silica mixes.

Effect of Composition

1. The mixes with a blend of half lime and half cement to nine parts of fly ash and cinders showed the most consistent variation of strength with time and pressure of autoclaving. There were no freakish values as in some of the other mixes.
2. With a fixed ratio of 5 percent lime, 5 percent cement and 90 percent fly ash plus cinders (a 1:9 mix in terms of cost), the fly ash content was varied from 15 to 25 percent with practically no change in strength.
3. The above mixes showed excellent reproduceability, the 20 percent fly ash series reproducing the 15 percent series with an average mean variation of less than 2 percent at 18 points (3 pressures, 3 durations for both compression and bending).
4. Comparing Figs. 5, 6 and 7 (in the previous May 1954, article) for fly ash and sand with data in Table III above for fly ash and cinders, it appears that in 1 : 9 mixes (classing fly ash as aggregate), the following can be said:
   (a) With cement alone (Fig. 6) percentage of fly ash was critical, a variation from 10-20 percent of total, reducing strength by one-third.
   (b) With lime alone (Fig. 7) fly ash was increased all the way from 10 percent to 50 percent of total with very little change in compressive strength. All values were, however, lower than the optimum values for cement.
   (c) In the 5 percent lime, 5 percent cement blend, (Fig. 5) the effect of variation in fly ash was intermediate between all cement and all lime while the strengths averaged as good as cement.
   (d) In the blended lime-cement

mixes with cinders instead of sand (Table III), fly ash was varied from 15 to 25 percent of total with negligible effect on strengths which averaged at least as good as with straight cement.

5. Where fly ash was used as a replacement for aggregate rather than for cement or lime, blended lime-cement averaged as good strengths as straight cement at lower curing periods and pressures and gave higher strengths at all 20-hr. periods and all 150 p.s.i. pressures. (Compare with adverse effect mentioned in 4 (May article) when fly ash was used as replacement for cement and lime instead of aggregate.)

Effect of Pressure and Time

6. In Fig. 8 strengths increased consistently with increasing pressures up to 150 p.s.i. and with increasing curing periods at full pressures up to 20 hr. The only exception was at 150 p.s.i. for 20 hr. where over induration had apparently been reached.
7. In the above blended lime-cement-fly ash mixes, (Fig. 8), increase of curing time appears to be more important than increase in pressure, 8 hr. at 100 p.s.i. being slightly better than 4 hr. at 150 p.s.i.
8. Cement-fly ash-cinder bars (Fig. 9) and straight cement-cinder bars (Fig. 10), indicate that:
   (a) Fair strengths may develop at pressures as low as 50 p.s.i.
   (b) Over induration may occur at 150 p.s.i., giving strengths no better than at 50 p.s.i.
9. Without lime, the cement-fly ash reaction appeared to give a less consistent relationship to curing conditions, one erratic value for neat cement fly ash paste (not shown) giving highest strengths at 4 hr. (100 p.s.i.).
10. Based on a comparison of Figs. 8 and 9 (and on a study of other investigations with lime), it appears that with fly ash, lime-containing mixes are benefitted by increased induration more than the cement mixes.
11. Fig. 10 for 20 percent cement, 80 percent cinder bars, when compared with Fig. 9, indicates that 1 : 4 cinder bars can be cured 8 hr. at less than half the usual pressure with no loss of strength, provided half the cement is replaced by fly ash.
12. Fig. 11 by C. A. Menzel[5] shows that with silica flour, low pressures like 50 p.s.i. are uneconomical. Since tests were made on neat pastes, direct strength comparisons with the bars in Fig. 3 can not be made, but they do definitely indicate the value of a minimum exposure to steam at top pressure of at least 8 hr.
13. Autoclavers with old sand-lime brick cylinders good for only 100 p.s.i. or prospective autoclavers planning to steam one cycle a day with an old boiler good for only 100 p.s.i. or less should definitely investigate the use of lime-cement fly ash mixes for lower pressures.
14. Results above are based on exploratory studies which, except for the data of Fig. 8, have not been checked by duplicate or parellel tests. Prospective users of lime-fly ash-cement formulations should first check results carefully with their own materials.
15. Because of the different mixing and placing characteristics of concretes containing fairly large proportions of lime or excessive amounts of fly ash, careful attention should be given to adequate mixing and vibratory periods to avoid sacrificing 25 to 50 percent of the potential strength of the concrete.

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(3) Easterly, H. W., **Discussion of Picket's article,** Concrete, Vol. 61 No. 7, July 1953, p. 12 and 43.
(4) Havlik, R. F., **"Steam Curing under Pressure,"** Cement Era, July 1910, p. 169.
(5) Menzel, C. A., **"Strength and Volume Change of Steam Cured Portland Cement Mortar and Concrete."** A.C.I. Journal, Nov.-Dec. 1934 Proceedings Vol. 31, p. 125.
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(9) Wig, R. J. and Davis, H. A., **"Value of High Pressure Steam Test of Portland Cement,"** Technologic Paper 47, Natl. Bu. of Standards, Aug. 18, '15.

N.B. The concluding article in this Research Foundation of the University of Toledo series will discuss lightweight and foam concretes and volume change characteristics of lime-fly ash formulations and their relation to conventional mixes.

A later series by the writer will discuss autoclave plant design and autoclave product manufacture based on research investigations to date.

Low Pressure Steam Curing

THE NATIONAL CONCRETE MASONRY ASSOCIATION has announced publication of the report "Some Tests of the Compressive Strength of Concrete Masonry Units as Affected by the Time-Temperature Maturity with Curing at Atmospheric Pressure." The tests, which were performed at the plant of Standard Building Products Co., Detroit, Mich., included nine different curing cycles and three types of storage after steam curing on representative specimens made from the same batch of concrete. The report presents a description of the manufacturing, curing, storage and test methods employed, along with the results obtained. The results obtained in a second series of tests with specimens made at a later date are also included.

•

TRUE MIX CONCRETE CO., Boise, Idaho, is moving its present operating facilities at 2943 Chinden Blvd. to a new plant, now under construction, west of 16th St. and south of the Boise River, as reported by C. D. Stevenson, plant manager.

Service pin awards were presented by Universal Concrete Pipe Co. during its annual sales meeting at Columbus, Ohio, to, front row, left to right: Harry V. Smith, Pittsburgh, 25 yr.; J. Walter Miller, Concrete Pipe Co. of Ohio, Cleveland, 10 yr.; Benny Mason, Columbus, 25 yr.; Grayum Bing, president, Concrete Pipe Co. of Ohio, Cleveland, 15 yr. Back row, left to right: Myron Miller, Norristown, 15 yr.; George Pullin, Port Washington, 5 yr.; Jim Graves, Louisville, 5 yr.; Palmer Stracco, Kenvil, N. J., 10 yr.; and H. N. Fletcher, Miami sewer div., 5 yr. Also receiving awards, but not shown, were Frank Bartrug, Baltimore, 15 yr.; John H. Briggs, Concrete Pipe Co. of Ohio, Erie, 15 yr.; and James Ehlert, Concrete Pipe Co. of Ohio, Cleveland, 5 yr.

Much amusement was created by this truck which illustrated methods of mixing concrete from 1900 to 1920. The third truck showed the most modern equipment

One of three trucks of Ready-Mixed Concrete Co., Denver, Colo., in parade. This one had a banner entitled, "The Progress of Concrete — 1940"

Colorful Displays for Good Public Relations

• Ready Mixed Concrete Co., Denver, Colo., builds goodwill by participation in industrial exhibits, Home Shows, and parades of civic interest

By ROBERT A. LATIMER

REMINDING THE PUBLIC-AT-LARGE of the importance which concrete plays in their lives, is the purpose of a program of "public relations displays" which Ready Mixed Concrete Co., Denver, Colo., has been carrying out for many years.

Frank P. Spratlen, Jr., president, feels that widespread goodwill is developed by calling attention to the proper mixing, pouring and engineering techniques required for concrete installations, and consequently, he regularly schedules displays at Denver Home Shows, industrial exhibits, etc., which are slanted at letting the public know something about concrete and its techniques.

Illustrated herewith is a typical display at a Denver industrial exhibit in the City Auditorium, which was the largest such display ever put on by a Colorado concrete producer. A complete truck-mixer was the centerpiece of the display to the left of a "display room" provided simply by the use of grass mat carpeting, and wrought iron furniture. In addition to keeping a company representative on the job explaining the mechanical features of the mixer, a four-section display on the bumper of the truck cited some of the "correct and incorrect" methods in pouring concrete, while a similar series of four panels at the side of the mixer, illustrated typical steps in everyday concrete pouring.

The panels along the bumper demonstrated first the control of aggregate segregation in concrete at the end of the conveyor belt, and also showed the correct and incorrect methods of cubic measurement for a specific job. Next, another panel indicated methods of placing concrete on a sloping surface, with correct and incorrect examples, worked out with wooden strips and actual concrete mix, in miniature scale. A third panel was devoted to control of segregation at the end of concrete chutes, showing how correct funneling, no matter how short the chute, insures precise, controlled delivery. In the fourth panel were samples of correctly and incorrectly cured concrete.

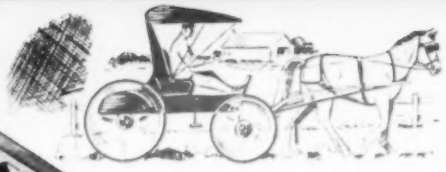
Similarly sampled were exhibits of the correct method of placing slab concrete from buggies, for installing deep, narrow walls, etc. One by one, the panels covered some of the more interesting engineering aspects of concrete installation, which stopped much traffic and kept Ready Mixed Concrete Co. executives busy with explanations.

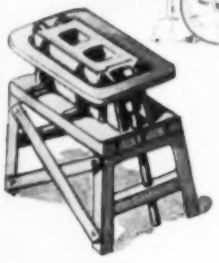
On a backdrop separating the display booth from the next, were photographic enlargements up to 6 ft. wide, demonstrating methods used in paving Denver's 17th Street through the city's financial district, plus other examples of Ready Mixed Concrete

(Continued on page 231)

This exhibit of one of the most modern types of transit mixer trucks drew a large number of viewers. The frames illustrated the right and wrong methods of laying concrete

The BESSER HALF-CENTURY.

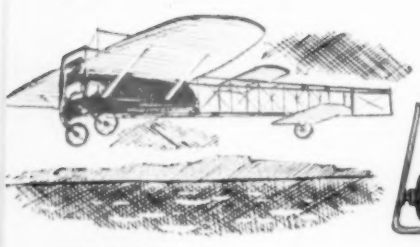




1904

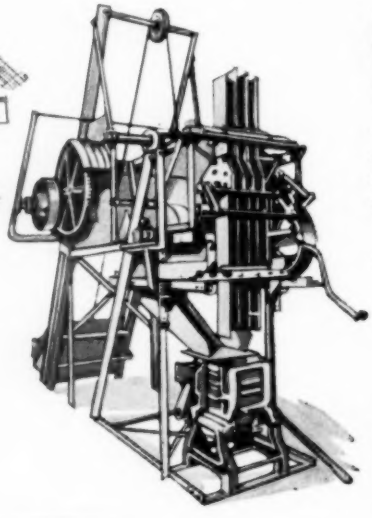
The horse and buggy was still the popular mode of transportation when the first Besser hand-tamp machine was made.

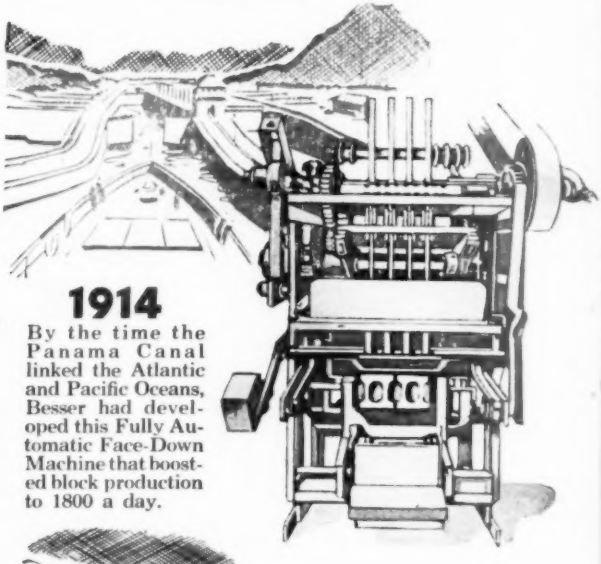
Industry has performed many "miracles" in the past half-century... and you find interesting parallels by comparing Besser achievements in concrete block machinery with some of the great steps in industrial progress. Besser has kept up front with industries setting the pace. Today's Besser VIBRAPAC represents almost inconceivable advances over earlier models that were great successes in their time. Besser achievements have produced equipment that continues to *make business good* for thousands of concrete block plants in worldwide service. Block plant operators . . . whose production topped 2-billion units in 1953... look confidently into the near future with prospects of expanding to 6-billion unit annual production. Look to Besser for continued progress... for equipment that will help you advance through years to come!



1909

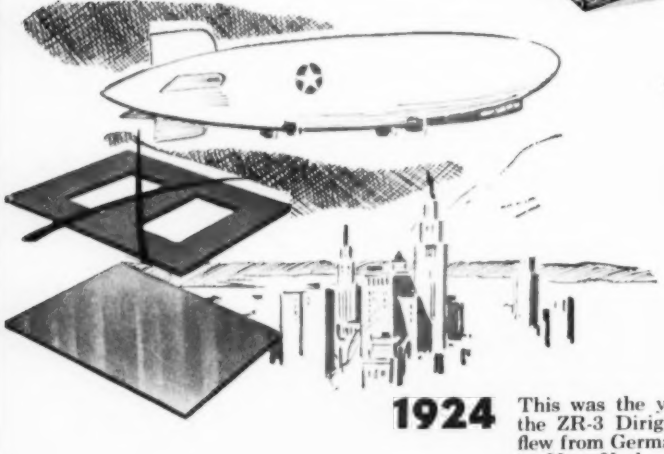
When Louis Bleriot astounded the world with the first flight over the English Channel, Besser was introducing this greatly advanced Power Tamper with skip loader.

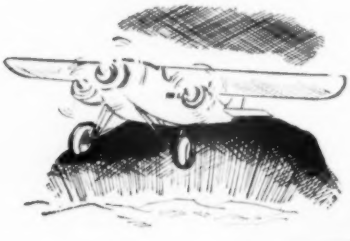


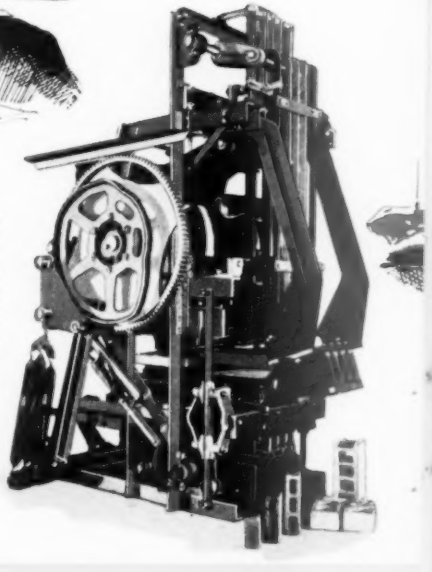


1914

By the time the Panama Canal linked the Atlantic and Pacific Oceans, Besser had developed this Fully Automatic Face-Down Machine that boosted block production to 1800 a day.







1924

This was the year the ZR-3 Dirigible flew from Germany to New York . . . the year Besser's Plain Pallet Stripper Tamper made *cored* pallets obsolete by producing *all sizes and types* of block on one set of *plain pallets*, at the rate of 3000 block a day.

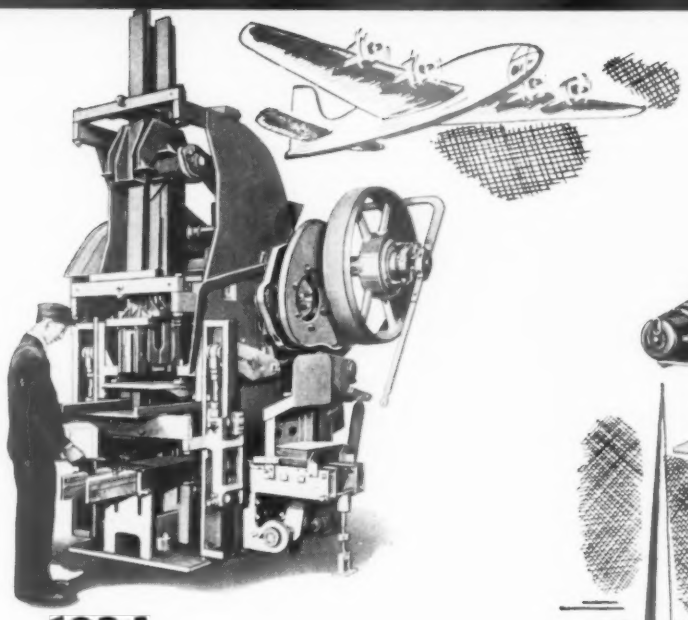
1929

During this year of Commander Richard E. Byrd's South Pole Achievements, Besser came out with the Cam Controlled Tampers for the Plain Pallet Strippers, for more positive control.

BESSER
50th Anniversary
1904-1954

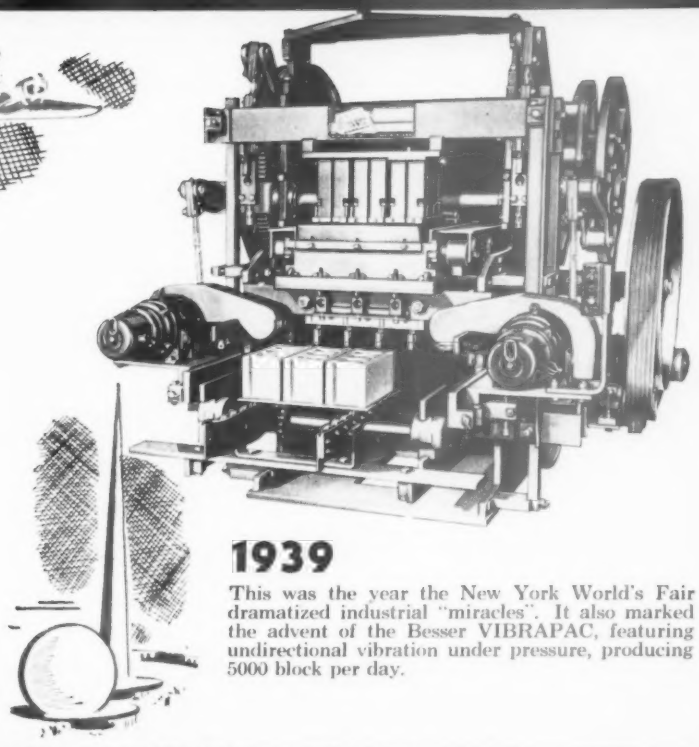
...a Half Century of Concrete Masonry Progress

RECORD OF ACHIEVEMENT



1934

Along with great advances in aircraft, came an important Besser development — the Fully Pressed Top Plain Pallet Stripper Tamper that made smoother finished block.

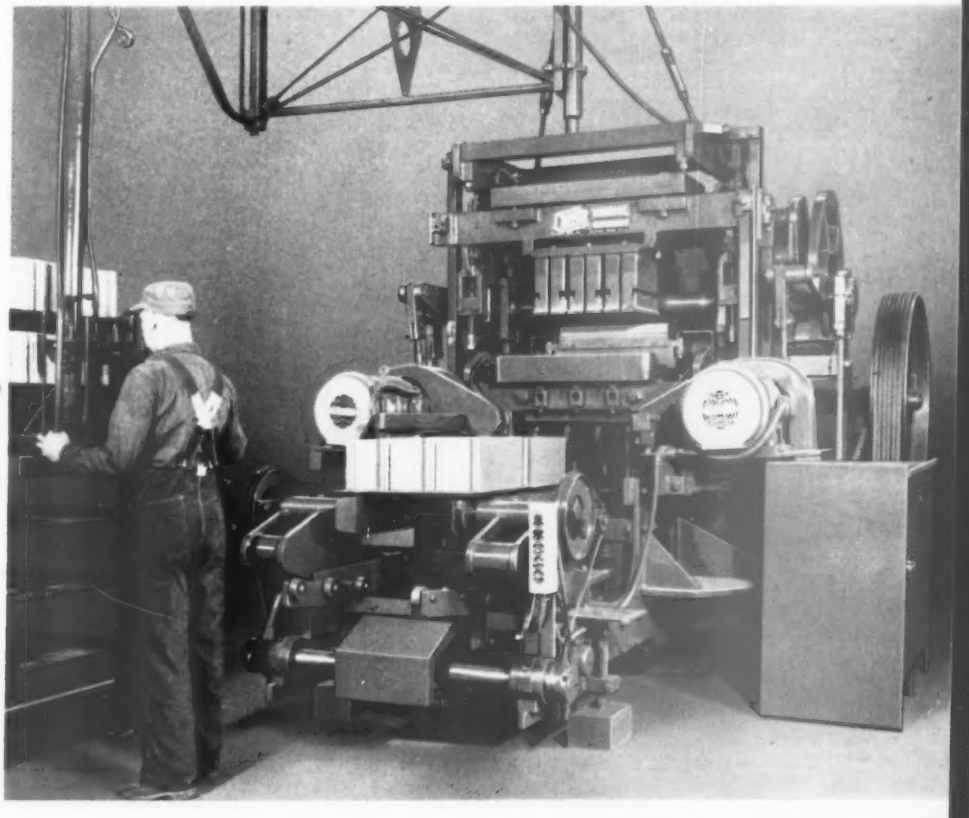


1939

This was the year the New York World's Fair dramatized industrial "miracles". It also marked the advent of the Besser VIBRAPAC, featuring undirectional vibration under pressure, producing 5000 block per day.

1954

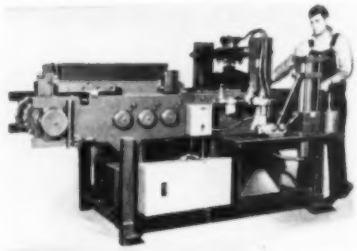
Jet planes, atomic submarines ... and today's great Front-Pallet-Feed Besser VIBRAPAC, with Power Offbearing Hoist for making 10,000 block per day ... the peak of 50 years' progress in concrete block machinery.



BESSER MANUFACTURING COMPANY • Alpena, Michigan, U.S.A.

J-3508

NEW MACHINERY



Pallet Cleaning Machine

BESSER MANUFACTURING CO., Alpena, Mich., has brought out a portable pallet cleaning machine which utilizes a heavy-duty blade with a Carboloy steel cutting insert to shave encrusted concrete from pallets down to the bare steel. When the end of the pallet is reached, the cutting blade is raised and lowered automatically to the edge of the next pallet. A heavy-duty chain and lug link carry the pallets through the machine to the proper blade position. The machine is said to automatically compensate for pallet thickness variations. It handles up to 300 pallets per hr., and operates on standard air pressure with air and electrical controls.

Compression Tester

FORNEY'S INC., 209 Elm St., New Castle, Penn., has brought out the Model QC-125 concrete compression tester which will test both 8- x 8- x 16-in. block and 6- x 12-in. cylinders, with a capacity of up to 125 tons. A quick-change riser block permits the platen to be adjusted either up or down for cylinders or block, eliminating excessive pumping. An 18- x 21-in. steel plate fastens to the rear of the tester to facilitate levelling or capping. A comprehensive 8- x 12-in. aluminum conversion chart is attached beneath the pressure gage, giving conversions from tons of platen pressure to p.s.i. of the specimen. The 8-in. Bourden tube pressure gage is equipped with a red maximum hand which remains at the point of failure until returned manually to zero. A snubber valve is mounted in the gage line to prevent damage due to the bursting of a specimen, and removable metal shields cover the cylinder and piston assembly. Overall height of the unit is 65 in., width, 37 in., and depth, 31 in.

Masonry Saw

FELKER MANUFACTURING CO., Torrence, Calif., has developed the "Di-Met" masonry saw designed for use on masonry materials. This cut-off saw operates either wet or dry and uses either diamond abrasive blades or abrasive cut-off wheels. Step-cutting, through-cutting, skew-cutting and angle-cutting may be handled by the saw. Adjustments are made from the operating position. The head rises to the necessary height on two telescoping standards at the rear of the machine. It is mechanically lifted from the front by a series of pumps on the foot pedal. The height adjustment is great enough to permit the arbor to remain in a horizontal position regardless of work size. The arbor can be tilted, however, and locked at the desired angle. The head and motor may be removed from the frame by loosening two pivot screws for portability. The base is of welded steel tubing construction, cross braced for maximum strength. It contains a coolant tray and a rolling table that is mounted on protected, replaceable steel tracks.

An electric pump supplies coolant to the blade for wet cutting. No belts need be removed when dry cutting, as the electric pump is direct-driven and totally independent from the blade power supply. The motor is 1½ hp., and a selector switch sets the correct line voltage.

Lift Truck

HYSTER CO., 2902 N. E. Clackamas St., Portland 8, Ore., has brought out the Model RC-150 lift truck, with a 15,000-lb. capacity at 24-in. load centers mounted on 8.25 x 20 pneumatic tires and powered by a heavy-duty, water-cooled industrial engine. The truck is said to operate on rough terrain, loaded or unloaded, due to its design featuring balanced weight, power and large size tires. Other features claimed for the unit are serviceability, ease of operation, and ample underclearance. It is also available in capacities of 16,000 and 18,000 lb. at 24-in. load centers.

Colored Cement

MURRAY-WILLIAMS COLOR AND CHEMICAL CO., 353 Boyden Ave., Maplewood, N. J., has developed a factory-mixed colored cement for driveways, sidewalks, patios, fireplaces, decorative masonry, etc. Designated Rainbow colored cement, it is a blend of mineral pigments and white portland cement. The ratio of pigments to cement are within P.C.A. tolerances recommended for strength, bond and durability. The colors are said to be unaffected by sunlight and weather, nor are the pigments said to react chemically with the cement to weaken the concrete and cause streaking. The colored cement is packaged in 25-, 50- and 100-lb. bags, and is available in green, yellow, black, blue, red, brown, gray and white.

RADIO Offers Many Advantages

• Concluding article on subject discusses leasing vs. ownership

23. A producer views the ready-mixed concrete business

BY JAS. A. NICHOLSON*

WHETHER YOU OWN OR LEASE, radio doesn't cost; it pays. The use of radio not only improves customer service and operating efficiency, but in effecting reduced costs, it actually saves you money. In the overall, the important point is that radio is put to work controlling operations. In comparison, it is a relatively unimportant matter whether you own the radio equipment or have a lease arrangement. The cost per year for owning has been somewhat less than leasing. Now that the communications tax has been reduced from 25% to 10%,† the difference in yearly costs should be practically erased with the one principal cost advantage of owning being the value of the radio equipment remaining after five years of use. An important uncertainty, to the wisdom of ownership, is the possible cancellation of one's radio license.

The "pro's and con's" of owning or leasing are sufficiently controversial that it would be wise for any producer, planning to install radio service, to get both sides of the story.

We have already discussed how the use of radio enables a producer to cut costs. An efficient operator, using radio, should effect a daily savings of 30 to 45 min. operating time on each trucking unit. If a mixer truck costs $5.00 per hr. to operate, one is saving in each day's operation $2.50 to $3.75 on each truck. The figures (broken down) of a radio-owning operator, Anderson Concrete Corp., Columbus, Ohio, show daily radio costs to be $.75 per truck. In our own leasing arrangements, our breakdown indicates that the daily radio cost per trucking unit is $.90. Depending on how efficiently we use radio to control delivery operations, both of us are able to make a daily saving of $1.75 upwards on each truck. We also know that substantial labor savings are being effected at each plant operation.

The "Bell" people, in their efforts to sell you on the merits of leasing, will probably urge consideration of the following:

1. In leasing, you know exactly what your costs are.
2. The Bell system is exclusively devoted to communications services.
3. Bell has more radio "know-how" than any other organization.
4. Leasing permits better adaptation to seasonal variations of the ready-mixed concrete business (e.g. save costs by removing radios from trucks not being used during winter months.)
5. Services proposed by sellers are contingent upon the availability of one or several technicians. In case of trouble, what happens if they are busy elsewhere?
6. You suffer a loss of return on capital invested in radio. You might be able to otherwise more profitably use the money.

In a lease agreement with Bell Telephone, radio-using producers agree to furnish land, office space, etc. for the land transmitter/receiver and antenna; erect an antenna support mast, hold the telephone company harmless from damage that might result, take on the tasks of securing construction permits, licenses and other required authorizations, assume full responsibility for radio operation and obligations as to F.C.C. rules and regulations, take necessary precautions to protect leased equipment against theft and damage, and agree upon termination, to return all the radio equipment in good condition, reasonable wear and tear excepted. It is stipulated that the lease agreement shall run for a five-year period, subject, on certain conditions, to a 6 month's cancellation period by either party.

In considering the advisability of a lease arrangement, one should understand that he is entering into a five-year agreement, subject to cancellation by the producer prior to the expiration date upon the payment of a specified termination charge. These termination payments may represent important money.

As part of its committments under the leasing arrangements, the telephone company agrees to furnish all wire and radio facilities for a complete communications system, to modify the system and add to it as required, have qualified engineers maintain and repair the equipment free of additional costs and to replace, without charge (except in case of lessee's negligence) any worn, stolen or damaged equipment.

A producer, using radio under a lease arrangement, should avoid placing complete dependence on the telephone company. Radio is so important to our industry that an operator should maintain an alert, continuing interest in all radio matters, including equipment problems, regulatory measures and license modifications. There is certainly a possibility that the best interests of the telephone company and the producer may not always coincide.

In stressing the advantages of ownership, a mobile radio salesman will probably bring to your attention that:

1. It costs less to own; in leasing, you are paying a profit to Bell.
2. There are a number of extra costs in leasing that should be considered.
3. Maintenance and repair services rendered by Bell may be limited to an 8-hr. day, 40-hr. week, while the mobile radio company service engineers will be available around the clock.
4. Service offered by Bell will probably be withheld during periods that the telephone company is strike-bound.
5. For repairs, you must take your trucks to the Bell Service Station while the radio company's maintenance engineers will come to your plants.
6. In the telephone company's lease arrangement, you never own the equipment; if you insist, upon leasing, he is willing to work out a lease deal whereby you can eventually become the owner.
7. In leasing, you may be helping telephone companies to establish monopolistic control over air channels, thus creating a condition that might someday prove harmful to the ready-mixed concrete industry.

The producer who purchases radio equipment assumes approximately the same responsibilities as does the leasing operator to which, in his case, are added the worries and obligations of ownership. In addition to the primary costs involved in purchasing and installing equipment, producers who buy radio units must also consider these other cost items: damage to or theft of units, interest on investment, service and maintenance arrangements, possible additional tax charges, attention to F.C.C. regulations, insurance protection and legal representation.

When you own the radio equipment,

(Continued on page 227)

*Pres. Nicholson Concrete Co., Toledo, Ohio

†As of June 10, Internal Revenue Department has dropped 10% tax as applied to rental equipment.

Ohio Ready Mix Producers Discuss Industry Problems

• Ohio Ready Mixed Concrete Association convention in Cleveland includes interesting array of papers and reports on maintenance, cost accounting practices, radio and selling methods

By HUBERT C. PERSONS*

ONE OF THE BEST ATTENDED MEETINGS of the Ohio Ready Mixed Concrete Association was held in Cleveland, June 15 and 16. Carl F. Shoaff of the J. P. Loomis Coal and Supply Co., Akron, was elected president. Charles P. Dittrich, Hilltop Building Materials Co., Cincinnati, was elected vice-president. Ralph H. Anderson of Columbus was re-elected treasurer, and Claude L. Clark, Columbus, was re-elected secretary.

Directors elected for a three-year term are James A. Nicholson, Toledo, the retiring president; E. E. Osborne, Clinton Construction Co., Wilmington, and Roger H. Slugg, Hamilton Gravel Co., Hamilton. John T. Muller, Youngstown, was elected to the board of directors for a one-year term.

Registration and meetings of the directors and members of the Specification and Labor committees occupied the time of the first day, June 15. In the evening, 126 attended the Cleveland-Washington baseball game.

In calling the meeting to order on the second day, President Nicholson announced that the membership of the association had increased by 22 during the year to a total of 111. President Nicholson declared that the healthy growth of the association was due in a large measure to the excellent work done by the various standing committees. He referred especially to the committees on Labor, Specifications, Cement and the committee on the Short Course. He also emphasized the need for a standing committee on Promotion which he said was necessary to combat certain types of competition.

Mr. Nicholson credited the Specifications Committee, of which R. P. Mumford is chairman, with effective work in keeping concrete in the specifications for the Ohio Turnpike. He also warned members to be on the alert to head off the dangers of restrictive and oppressive labor costs in truck operation.

Members of the Cement Committee see no shortage of cement in the near future, according to George J. Frye, committee chairman.

The next ready-mixed concrete short course will be held February 7 and 8, 1955, at Ohio State University. Other features of the morning session, June 16, were addresses by Ed Pitzer, fleet superintendent of Hilltop Building Materials, Inc., Cincinnati, and President James A. Nicholson.

Cost Accounting

Mr. Pitzer spoke on "Cost Accounting in Ready-Mixed Concrete," which he declared would save money and help ready-mixed concrete operators solve many problems. (An article describing some of these maintenance and accounting practices and forms appeared in ROCK PRODUCTS, November, 1953, p. 140).

The speaker explained that since a discussion of all costs would require too much time he would confine his remarks to one of the larger items of cost, that involved in maintenance and delivery. Mr. Pitzer divided these costs into two categories: first, practical suggestions for cost records; and second, fleet maintenance costs and how they may be used to advantage. He said the method he used could be applied equally well to a large or small operation.

To provide a background for his talk, Mr. Pitzer explained that Hilltop operates approximately 100 pieces of equipment. "The majority of these," he said, "are Mack tandem trucks with 3-, 4½- and 5-cu.yd. Smith mixers. Our mechanical department does 95 percent of all repairs and we have "lube" men to service our units. We operate in hilly country; ground conditions are mostly clay and we serve residential, industrial and road contractors." Mr. Pitzer described seven forms used in his cost accounting system.

"We total the costs and divide the number of cubic yards into that figure to arrive at an average cost per cubic yard. For instance, if our delivery costs were $120,000 and we hauled 50,000 cu.yd. of concrete, our average cost would be $2.40 per cu.yd. Is this too high? If we break it down into a cost per cu.yd. per truck mixer unit, we will start to get an answer. We may find that one unit will deliver concrete for $2.95 per cu.yd., while another unit will do the same job at a cost of only $2.05. This gives us a definite idea that at least one unit isn't doing a very good job. We generally find that one or possibly two large justified expenses are the reason, or, in other instances, it may be a series of constant breakdown expenses. In the latter case, we prove that the unit isn't the right type of equipment for the job. One important point to remember is that a large expenditure in one year can mean a much more profitable operation in the future.

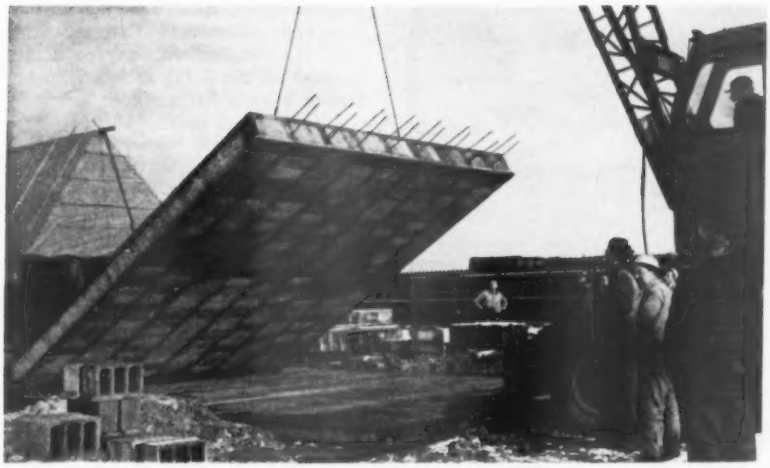
"If, on the other hand, we find most unit cost per cu.yd. figures in line, the problem then can be approached by analyzing the various total costs. We found the parts and labor costs to be too high one year. We decided that by purchasing more rugged equipment that would haul larger loads legally and absorb more punishment, we could reduce frequent and costly breakdowns. We realized that although the initial cost was higher, which in turn would increase the depreciation amount, the reduction in parts usage cost, driver and mechanical wages will generally offset this initial cost by as much as 15 percent. We concluded from this that the larger equipment was best suited to our particular operation. We also found that although we are using much larger engines the gasoline consumption per cubic yard is about the same as for the smaller engines."

Radio in Ready Mix Industry

In the closing address of the morning session, June 16, President Nicholson declared that radio control is the most significant development in ready-mixed concrete since the introduction of the high discharge truck mixer. He spoke on "Radio in Ready Mix." The speaker described the successful use of radio in controlling ready-mixed concrete deliveries in Toledo during the past year. "Two-way radio," he said, "is a new tool for improving

(Continued on page 229)

*Public Relations consultant, formerly manager, Public Relations Bureau, Portland Cement Association



Completed panel being lifted off the platform on which it was constructed

SOFFIT BLOCK
In Tilt-Up Construction

By TIP BROWN

SOMEBODY ONCE GAINED FAME with a remark that there is nothing new under the sun. It seems quite likely that he had little or no acquaintance with lightweight concrete soffit blocks. He shouldn't be blamed too much as no one else knew a great deal about them until recent times. Three widely differing uses of these members of the concrete block family have been selected for this article.

Down Tulsa, Okla., way, these masonry units are being prestressed in plank formation for giving fireproof roofs to otherwise fireproof concrete masonry houses. Near Peoria, Ill., the roof and second floor of a new million dollar Limestone Community High school are of soffit block laid in huge panels on the ground floor and lifted into final position by the "Youtz-Slick" method of jacking into place and welding on steel columns. Across country in the State of Washington, soffit block without mortar were used in tilt-up operations on an unusual warehouse project in Spokane.

In all of these jobs, the advantages in construction time, saving of weight, fire safety, insulation values, permanency, and cost of construction were apparent. Lightweight aggregates played a leading role in these revolutionary changes in construction methods. Suffice it to say, from the standpoint of the masonry manufacturer, any one of these advantages gives him a fine working tool in broadening his market. Let's have a closer look at these jobs and see why designers are using soffit block to meet some of the construction needs.

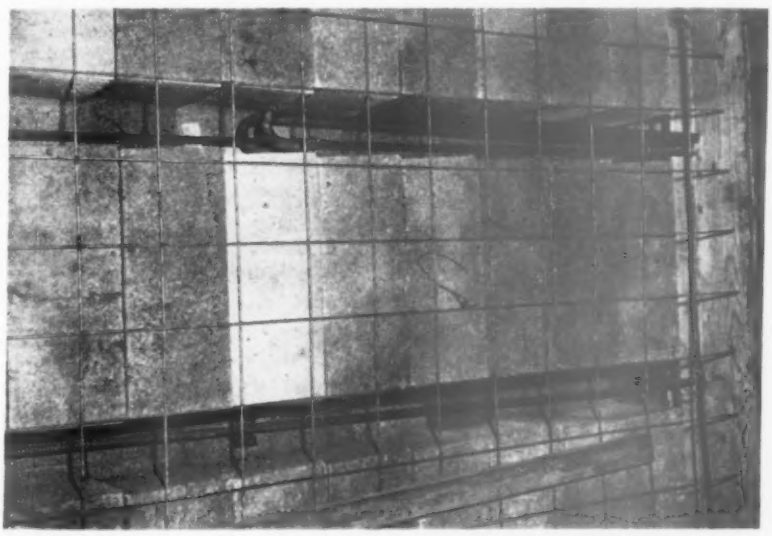
Overhead Fire Protection

P. F. Blair & Son, Tulsa, Okla., has a roomy shop building and storage yard on an eight-acre tract in West Tulsa where for a number of years, the company has been pioneering in the manufacture of precast and prestressed units with installations over a wide area. Among other advanced ideas, prestressing has been applied to soffit blocks and substantial weight savings have been achieved in combination with lightweight aggregate. Prestressing has the effect of transferring a portion of the load to the blocks which ordinarily are just space fillers. By the elimination of shoring, 50 cents per square foot in costs have been saved. The soffit block are made into "planks" which in turn are set in place by a crane. In the prestressing process, the soffit block are laid on a levelled pallet and made into plank formations. Either two or four wires are used, depending on the length of span in which the planks are used. The wire is prestressed to 7100 p.s.i.

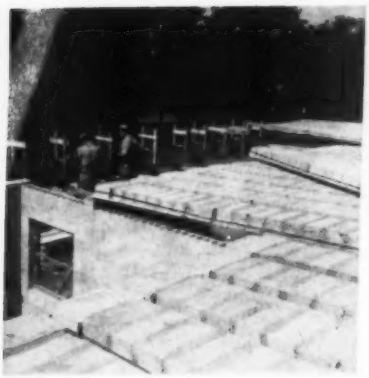
The company has built several all-concrete masonry houses in Tulsa, utilizing soffit block for the roof, thus obtaining full fireproofing with very substantial savings to the owner in fire insurance premiums. Exterior roof applications included 1 in. of rigid insulation and a conventional built-up roofing. Acoustical plaster was applied to the under side of the roof.

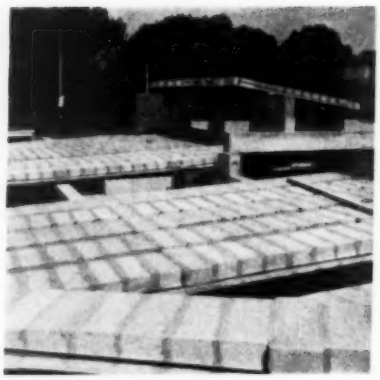
Soffit Block in Roof Slab Lifting Job

The high school job near Peoria, Ill., was designed by Architects Hewitt & Bastian, Peoria, with Pfuhl & Shideler, Kansas City, Mo., as structural engineers, and C. Iber & Sons, Peoria, as general contractors. The Skyhook division of the Long Construction Co., Kansas City, Mo., handled the roof slab lifting portion of the construction. The Irions Concrete Block Co., Chillicothe, Ill., are credited with able assistance in the development of the soffit block by engineers of the Besser Manufacturing Co., who successfully



Close-up of one of the soffit block panels showing the steel reinforcing before covering with 2½-in. of lightweight concrete





Views of soffit block roof construction in Tulsa, Okla.

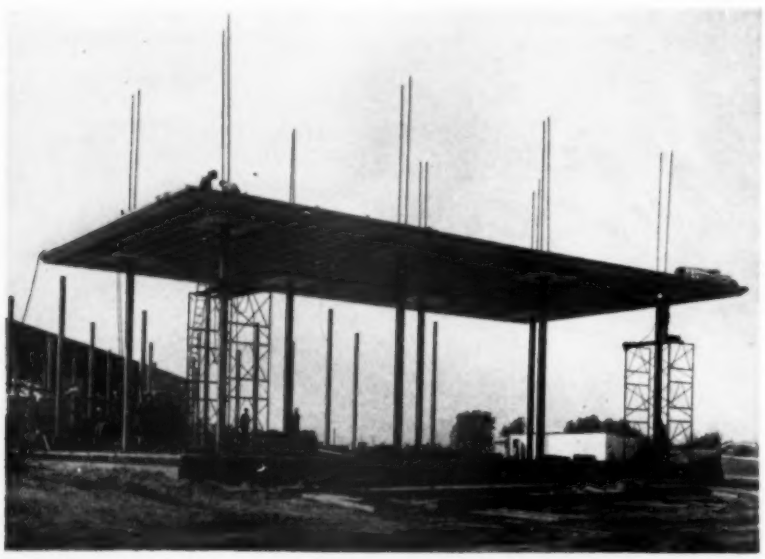
solved other peculiar problems of manufacture.

The school is two stories in height with 91,500 sq. ft. of area to accommodate some 900 pupils. The lift-slabs are of lightweight concrete "waffle" soffit block which provide a noise absorbing ceiling. The slab lifting was over in four weeks and the school was opened in ten months. Laid side by side, the block make a continuous form like the grid of a waffle iron.

To lighten the structure and also provide good acoustics, the slabs were composed of 2-ft. square soffit block made of 2000 p.s.i. lightweight concrete. These units were 8¾ in. deep with 2-in. thick shells and a 3-in. flange to carry the reinforcing rods and poured concrete of the 11-in. deep slab. Roof and second floor slabs were cast in sequence on the ground floor, and then jacked up and welded on the 8-in. square steel columns, utilizing the Youtz-Slick method of lifting into place. The largest of the slabs was 60 x 82 ft. and weighed 275 tons, and they were carried on 12 steel columns.

The slab cost was $2 per sq. ft., a considerable saving over cast-in-place slabs. Three months time in construction is said to have been saved. Weight savings which always reflect economies in many directions and acoustical features of the slabs were additional assets. Incidentally, the various contractors serving the job saved much hoisting expense by loading their materials and equipment on the slabs prior to lifting and riding free with the slabs as they move upward.

The appearance of the exposed underside of the coffer blocks was greatly improved by spray painting and with no loss of acoustical property. The resulting acoustical absorption is superior to that which can be obtained with any non-acoustical absorbent applied to a flat surface because the area of exposed surface of the soffit block is approximately 1.8 times as great as the area of the flat ceiling. In this way, the absorption characteristic is equivalent to that which would be obtained by using a 90 percent flat absorbent treatment. The architects were not familiar with any particular method for obtaining such a high absorbence on a flat surface.



First slab section lifted for Limestone Community High School, Peoria County, Illinois, using Youtz-Slick method

Soffit Block in Tilt-Up Operations

In Spokane, Wash., the Underwriters Salvage Co., a New York concern, had a problem in building a new warehouse to be used for salvage materials, involving the use of a hose stream and later drying in a uniformly warm area. After critical studies of construction costs, thermal and durability factors, the architect chose lightweight soffit block, faced with Haydite concrete, assembled in panels on the concrete floor of the building and lifted by crane into wall position. It is thought this is the first example of such use in this country.

The building is 50 x 100 ft., one story in height. The soffit wall sections were assembled tight against one another without mortar joints and faced in 16½- x 16-ft. dimensions, each requiring two hundred 12-in. block, 25 courses high and eight courses long.

The block were produced in the plant of the Layrite Concrete Products Co., Spokane. The Smithwick Concrete Products Co., Portland, Ore., shipped the Haydite aggregate to the Central Pre-Mix Co., Spokane, that furnished the Haydite concrete designed for 4400 lb. at 28 days. The block were first assembled on the floor slab and topped with 2½-in. thick Haydite expanded shale concrete, troweled to a smooth finish and cured in the open with wet burlap.

As the mortar joints were eliminated, the usual procedure of facing the block pattern toward the interior was reversed. This permitted direct and continuous hose streams of hot water to later play upon a waterproof interior monolithic concrete wall.

Weight comparison was a strong factor in the use of lightweight aggregate in the panels. Sand and gravel concrete for the same panel dimensions with a weight of 150 p.c.f. would total 26,400 lb. for an 8-in. monolithic tilt-up job. The 12-in. lightweight soffit block of 21-in. length, required 200 to the panel or approximately 8000 lb. The 2½-in. topping over this area at 95 p.c.f. weighed approximately 5016 lb. or a total weight of the panel of 13,016 lb. Thus, it is seen that the 14½-in. wall thickness (12-in. block plus 2½-in. Haydite concrete) weighed approximately 50 percent that of an 8-in. heavy concrete wall. The scales tipped quite heavily in favor of the lightweight wall — perhaps an equivalent of 48 in. of heavy concrete. The soffit block were of standard type for roofs or floors.

(Continued on page 232)

Radio—Lease or Own

(Continued from page 223)

budget for, purchase and always have on hand sufficient spare units to replace radios down for repair. Quickly replace poorly operating units with spare radios to keep concrete trucks in operation. Whether you own or lease, insist upon a service arrangement that does not interfere with truck delivery schedules.

In the estimated yearly cost figure comparison that we worked out for an operator using 15 mobile radio units, annual costs to the producer on a lease arrangement, exclusive of the 10 percent communications tax, came to $4225. At the present time, that annual tax would be $422.50. If we are going to consider cost of interest in purchasing radio equipment, we've got to consider it in leasing; (5 percent of $4,647.50 equals $232.38) which, when added to leasing charges and a 10 percent communications tax, gives a total of $4,879.88.

Our estimated comparison figures show that the annual cost for owning the 15 radio units is $4,653.24. As one studies these figures, it is apparent that under today's selling prices and lease costs, the insignificant cost difference (in the first 5-year period) between owning and leasing is in the 10 percent communications tax.

A producer, in considering advantages of owning or leasing might wish to look beyond the 5-year period. In our figures, we have written-off the equipment on a 5-year basis. After the expiration of this period, a substantial value might still remain. If the estimated value at that time should figure to be approximately 25 percent of original cost, an additional $500 could be deducted (in one's thinking) making the annual cost of owning $4,153.-24. If radio equipment could be kept in efficient operation throughout a second 5-year period without incurring substantial maintenance increases and requiring costly replacement parts, the case for ownership would definitely appear stronger.

When we attempted to judge the comparative advantages and disadvantages of owning or leasing, several points rated important consideration.

1. How prolonged would be the 25 percent tax on communications service? Comparison-wise, of what effect would be the elimination of this tax or, thinking more practically, a reduction to 10 percent.

2. If leasing, of what cost-importance would be the extra expense involved in taking trucks to the Bell service station? How could radio maintenance be handled during a telephone company "strike period?"

3. If owning, how costly and especially how dependable would be the

maintenance program offered by the service engineer? What "out" have we got should his services flop?

4. Would one want to take a chance on owning if he is operating in a large metropolitan area, in population closely approaching the F.C.C. established 500,000 limit?

When the 25 percent tax was in the picture and where the question of invested money was not highly important, it was probably advantageous costwise to purchase radio equipment. The cost difference may have been eliminated with the sizable reduction in the communications tax. Even though the Bell people expect to make a profit out of their leasing arrangements, the cost to the lessee of this profit may be offset by an additional tax deduction. On the other hand, the possible development of an air channel monopoly for the Bell system may also deserve consideration. A producer's answer to the question of "whether to own or lease?" will likely be based on whether one believes that the services offered by Bell plus freedom from ownership worries are worth the slightly additional costs. In the final analysis, a producer's decision on owning or leasing will be determined by his judgment of which service is likely to prove the more dependable.

Septic Tanks

(Continued from page 215)

The concrete quality of the Superior septic tank is another factor on which the success of the company has been based. The mix normally is comprised of 60 percent sand, 40 percent ⅜-in. coarse aggregate. Approximately 6 gal. of water is added to dry aggregate per sack of cement. A new C.M.C. three-bag mixer, added to the plant equipment this year, distributes the cement into a ½-cu. yd. Garbro bucket which is carried to the form by the overhead crane. During the pour, the form is continually vibrated with a V55 Syntron electric vibrator. In cold weather, the aggregate is heated in the bin with a circulating hot oil system which can produce temperatures up to 350 deg. F.

The normal daily pour at this plant includes two 500-gal. tanks, ten 750-gal. tanks and two 1000-gal. tanks. This is accomplished by four men in an 8-hr. day.

In addition to manufacturing septic tanks, the company maintains a complete installation service which operates from the home office and also a branch sales office in Mt. Clemens, Mich. The installation department has a complete staff of trained men who have available to them all the necessary equipment to install and service residential, commercial and industrial sewage disposal systems.

Key personnel of this company includes John G. Francis, Sr., as president; his two sons, Gerald T. Francis as installation supervisor and John G. Francis, Jr., as branch manager; and his son-in-law, John P. O'Connell as manager. The new steel form has been the fundamental piece of equipment that has enabled them to market over 2600 septic tanks a year for the past three years. Because of the success with this form, a separate firm, Thomas Steel Forms, Inc., has been organized to promote sales throughout the United States.

Acquires Ready-Mix Co.

THE HARRY T. CAMPBELL SONS CORP., Towson, Md., recently announced acquisition of the Clark Ready-Mix Concrete Co., formerly owned by Joseph and Jack Meyerhoff. The concrete division, which is to be carried on as a wholly-owned subsidiary, will be operated under the name of Clark Concrete, Inc. The sand and gravel properties and plant of the Clark company will be owned and operated by Nottingham Farms, Inc., another subsidiary of Harry T. Campbell Sons Corp.

•

KOST BROTHERS, INC., recently completed a $10,000 ready-mixed concrete plant at Fargo, N. D.

Ohio Ready-Mix Meeting

(Continued from page 224)

efficiency. I believe radio is a must for our industry. Improved service, reduced costs and operating efficiency result."

Mr. Nicholson said that 30 to 45 min. delivery time each day can be saved by the use of two-way radio. He said he knew of 55 ready-mixed concrete operators now using radio to control deliveries. (See ROCK PRODUCTS, June, 1954).

Address by President Collins

R. C. Collins of the Warner Co., Philadelphia, president of the National Ready Mixed Concrete Association, was the guest speaker at the annual luncheon, June 16. In his address on "Selling Ready Mix Concrete," Mr. Collins declared that although no one likes to admit it, the more technically-minded men in the engineering profession prefer job-mixed concrete to ready-mixed concrete. He said that situation constituted a challenge to the ready-mixed concrete industry and outlined the following two courses of procedure to overcome the challenge:

(1) "Improve the standards of operations in our industry so that the best performance available today becomes the minimum performance of tomorrow.

(2) "Those responsible for the sale of ready-mixed concrete must become so imbued with the improvement in performance that they can and do sell the 'technically-minded' engineer on this fact and break down his prejudices against our product.

"Then, and only then," Mr. Collins declared, "will ready-mixed concrete occupy the position in the construction industry that I think it deserves and can attain."

In his opening remarks, Mr. Collins referred to the successful efforts of the national association in having ready-mixed concrete exempted from renegotiation.

The speaker emphasized the fact that the ready-mixed concrete industry used more than 71 million barrels of portland cement last year in producing more than 53 million cubic yards of concrete valued at more than 636 million dollars. "That, my friends, is big business," he said.

Mr. Collins referred to a recent survey by the Portland Cement Association which showed that contractors rated price as sixth in importance in their appraisal of ready-mixed concrete.

"Although they are naturally concerned about price, they are more concerned," he said, "with maintenance of delivery schedules, strength, finish-

(Continued on page 231)

WHERE 2nd Best Won't DO

IT'S A JOB FOR...

Mack Trucks

That's what the Hamilton Gravel Co., prominent and progressive operator of Hamilton, Ohio, proved to its satisfaction soon after purchasing its first Mack six-wheelers only a year ago.

In a business where reputation depends upon reliable service and truck operating costs determine profit margins, Hamilton tested its two Mack units against all other-make trucks in its fleet, with these results:

The other trucks just didn't measure up to the Macks... in work... in payload... in lowest operating cost.

And so, despite higher initial price, Hamilton Gravel Co. bought more Mack six-wheelers.

If, like Hamilton, service and profits are your concern, you can't afford not to own a Mack!

WHEREVER YOU SEE TOUGH JOBS
...THERE IS WHERE YOU SEE MACKS

Only Mack six-wheel trucks offer the advantages of Mack's Balanced-Angle with its exclusive Power-Divider.

Mack Trucks, Empire State Building, New York 1, N. Y. Factory branches and distributors in all principal cities for service and parts. In Canada: Mack Trucks of Canada, Ltd.

ing qualities, and assurance of quantity than with price. This tends to bear out my contention that cost and not price is the important factor."

Mr. Collins stressed the value of sales agreement forms in the operations of a ready-mixed concrete business. The speaker recalled the value of sales agreement forms in periods when price controls were imposed. He warned his hearers that "There seems to be increasing evidence that we may become involved in another war. A recent news letter from Washington states that 'Price control legislation is ready for Eisenhower's nod and could be sent to Congress on short notice.' . . . "It is safe to assume," Mr. Collins said, "that these controls, when imposed, will freeze both prices and terms of sales as of a certain date. Unless the ready-mixed concrete producer has spelled out his terms and conditions of sale, and has ample proof of their existence, he will be at a distinct disadvantage in proving that he actually was selling under the conditions of sale which he claims. We know of no way to be protected in such cases except to have a sales agreement form."

Mr. Collins also warned his hearers to protect themselves against material price increases. "I feel that I would be remiss," he said, "if I did not urge you to take a good look at the clause in our suggested form regarding cement and aggregate cost escalation.

Public Relations

(Continued from page 219)

Co.'s participation in the overall building up of Denver's industry, streets, and civic facilities.

Likewise illustrated is the "comparative display" which the company staged during a parade held several years ago. Three trucks were used to illustrate progress from old-fashioned burro mixing of concrete to modern mixer preparation. Much humor was occasioned by the first truck in the three, which depicted two workmen garbed in the work clothes of the 1900-1920 period, mixing concrete in an iron barrel, with a hand-operated mixer on iron-strap supports, applying the final touches. Contrasted with "mixing enroute" methods, this display provided an illuminating comparison for the public.

•

WALT KUNZ, Forestville, Ohio, building contractor, has opened a ready-mixed concrete plant on a 4-acre tract on Route 125 at Tobasco, Ohio. Mr. Kunz also operates a ready-mixed concrete plant at Bethel, Ohio.

CLEMCO CONCRETE BLOCK CO., newly organized, has opened a concrete block plant at Kintzville, Iowa. Frank Bobbitt is plant manager.

Soffit Block

(Continued from page 226)

The saving in construction time was so obvious that completion was easily possible under mandatory conditions. Waterproof, weatherproof, fireproof, and crackproof advantages were likewise gained.

The architect was Kenneth W. Brooks, the structural engineers, Norrie & Campbell, the contractor, Roy L. Blair; all are local to the area.

All of these unusual jobs in roof and wall construction suggest that construction horizons are being lifted, too, and that the flexibility of cast units in combination with pouring and prestressing presents a gratifying prospect to the concrete products manufacturer. If he has his ear to the ground, they suggest permanent markets if he is disposed to gear his manufacture to serve in this field. It is good to be in a business with such a promising future whose new forms are now forging to the front. •

SUN CHEMICAL CO., Long Island City, N. Y., is producing a product called "Kwik-Roc," for quick repairs on interior concrete floors. Mixed with water and smoothed into cracks and holes, the product reportedly has twice the compressive strength of conventional concrete and can stand up under traffic within 45 min.

N.C.M.A. Wins Awards

THE NATIONAL CONCRETE MASONRY ASSOCIATION recently received top honors in the annual literature competition co-sponsored by The Producers' Council and the American Institute of Architects. The stated purpose of this competition is to recognize excellence in product literature directed to the architect and to aid manufacturers in increasing the technical and informative value of descriptive product literature of assistance to the architect in the selection and specifying of all building products for specific uses.

N.C.M.A. was awarded a "Certificate of Exceptional Merit," one of only three such awards presented this year in all product classifications, for its publication "Ideas for Wall Patterns with Concrete Masonry." The association also received an "Honorable Mention" for its book, "Design and Construction of Lintels for Concrete Masonry Buildings."

Louisville Cement Co., Louisville, Ky., was also awarded honors in the A.I.A. literature competition. The company received a "Certificate of Merit" for its new publication, "Type of Workmanship Recommended for Concrete Block Walls."

Slag Block Manual

THE NATIONAL SLAG ASSOCIATION has announced availability of its newly-revised slag block manual, entitled "Slag Concrete Masonry Units." The purpose of the manual, as stated by the association, is to provide information pertaining to the properties of slag and slag-concrete units that would be helpful to architects, engineers and block manufacturers. Information concerning slag-concrete units made with air-cooled, granulated, expanded, and blended slag aggregates is included. Practical and helpful data have been assembled to assist in the selection of the masonry unit best suited for particular types of construction. This 25-page, illustrated manual is available upon request from member companies or from the association's office at 613 Perpetual Building, Washington 4, D. C.

•

ZENITH CONCRETE PRODUCTS CO., Duluth, Minn., has expanded plant operations by the addition of two 128-ft. autoclaves for high-pressure steam-curing of concrete block. Capacity of the autoclaves reportedly is 3672 concrete block each.

CONCRETE MATERIALS CO., Galesburg, Ill., has opened a new office in Davenport, Iowa, for the promotion and sale in that area of its line of precast concrete products, including concrete steps, barbecues and incinerators.

Whitest . . . BY ANY STANDARD

Whitest in the bag
Whitest in the mix
Whitest in the completed job

There are so many places where it is better to use Trinity White. It is a *true* portland cement with the "greys" and "off-color casts" eliminated. Use it for architectural units; stucco; terrazzo; or any other job where appearance is important in good concrete. If your dealer does not carry Trinity White, write us direct.

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Trinity White
PORTLAND CEMENT

As white as snow

Front view showing operator feeding block into BES-STONE Block Splitter.

Make this your BEST year with the BES-STONE Block Splitter

Expand Your Opportunities — Cash in on the Split Block demand. Its "quarried stone" character pleases owners. You'll find it ideal for all structures, large or small . . . commercial, institutional or home construction. BES-STONE challenges the creative ability of both architects and builders.

Splitters in 18" and 24" sizes — Automatic, powerful, hydraulic operation . . . up to 960 Split Block per hour. Straight line cuts . . . No cull block. Easily adjustable for splitting various block heights. Block is placed under knife, automatically. And the finished Split Block is automatically removed from under the splitting knife by the incoming block. Quiet, safe operation.

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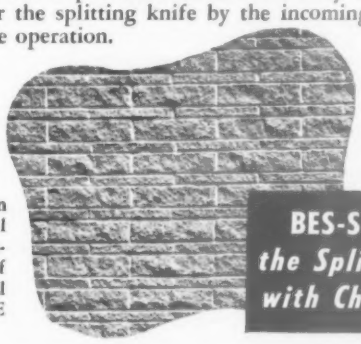
Profitable Producer of 960 Split Block per Hour!

There's big money for you in attractive, permanently colorful BES-STONE Split Block. It complements and increases sales of standard stripper block. Get all the facts. Write for BES-STONE Bulletins 95A and 100.



Note the natural beauty of BES-STONE. No maintenance, no painting, no peeling off.

BES-STONE *the Split Block with Character*

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Saves you 2/3 cost of regular Batch Plants!

SAVES TIME, SAVES LABOR COSTS. SAVES EQUIPMENT... PRACTICAL ON ANY TYPE JOB! EASY TO LOAD!

THE TRAVEL BATCHER can be used to transfer batches of any size from a dump truck to a truck mixer, because the hopper is built low enough to allow dump trucks to discharge into it. The "built-in" scales on the TRAVEL BATCHER allow batching from stock piles with any front-end loader. With the optional side bins added, TRAVEL BATCHER makes for greater production of "volume yardage." This revolutionary new machine reduces the initial purchase cost of a stationary batch plant by 2/3 or more. Because of its "on the job" maneuverability it reduces the number of truck mixers needed by as much as 83%. Maintenance bills, long a headache of every ready-mix concrete operator, are reduced to a minimum.

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ADDRESS _____

CITY _____ ZONE _____ STATE _____

— Sh-s-s-h! —

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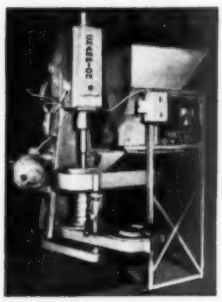

Increase BLOCK Output with a Sturdy Erickson

The Platform Truck "Custom-Built" for your racks—from 60 to 108 or more 8x8x16 blocks.

"THE BACKBONE OF BLOCK PRODUCTION" is what users still call the Erickson Platform Truck. Its rugged dependability to handle loaded racks from block machine to kiln assures top speed production with no delays or shut downs. The Erickson platform picks up all racks from the ends and places them close together in the kiln—no wasted space. For faster operation Erickson now offers 4 speeds forward and 4 speeds reverse. We will build you a truck exactly suited to your racks and doorways. Also fork type trucks.

Write for Catalog on Complete Line.

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GET YOUR MOLDS NOW, THEY WELL PAY FOR THEMSELVES, AND MAKE YOU A PROFIT EVEN BEFORE OUR INVOICE COMES DUE . . . PLACE YOUR ORDER NOW FOR IMMEDIATE DELIVERY. All Molds Guaranteed.

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12"x12"x2"	Each	$ 5.00
12"x24"x2"	Each	5.50
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B.S. 1.—4¼"x31½" long	Each	$15.00
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For 1" marble sills from 1'7" to 5'9"	Each	$24.50
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F.M.C. 180'S located at Goreville, Ill., Jefferson City, Mo., New Brighton, Pa.

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Also several plain pallet two and three block machines such as Lith-I-Bar, Multiplex, Go-Corp and Columbia. Why not modernize when your credit is good with Mid-Western?

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MORTAR COLORS
made by
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LIMEPROOF CONCENTRATED DRY COLORS
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50 Acres (source of sand). Excellent equipment. Going business at fraction of its potential. Write or call Joe Troop at

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- ___Bags*
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- ___Batchers
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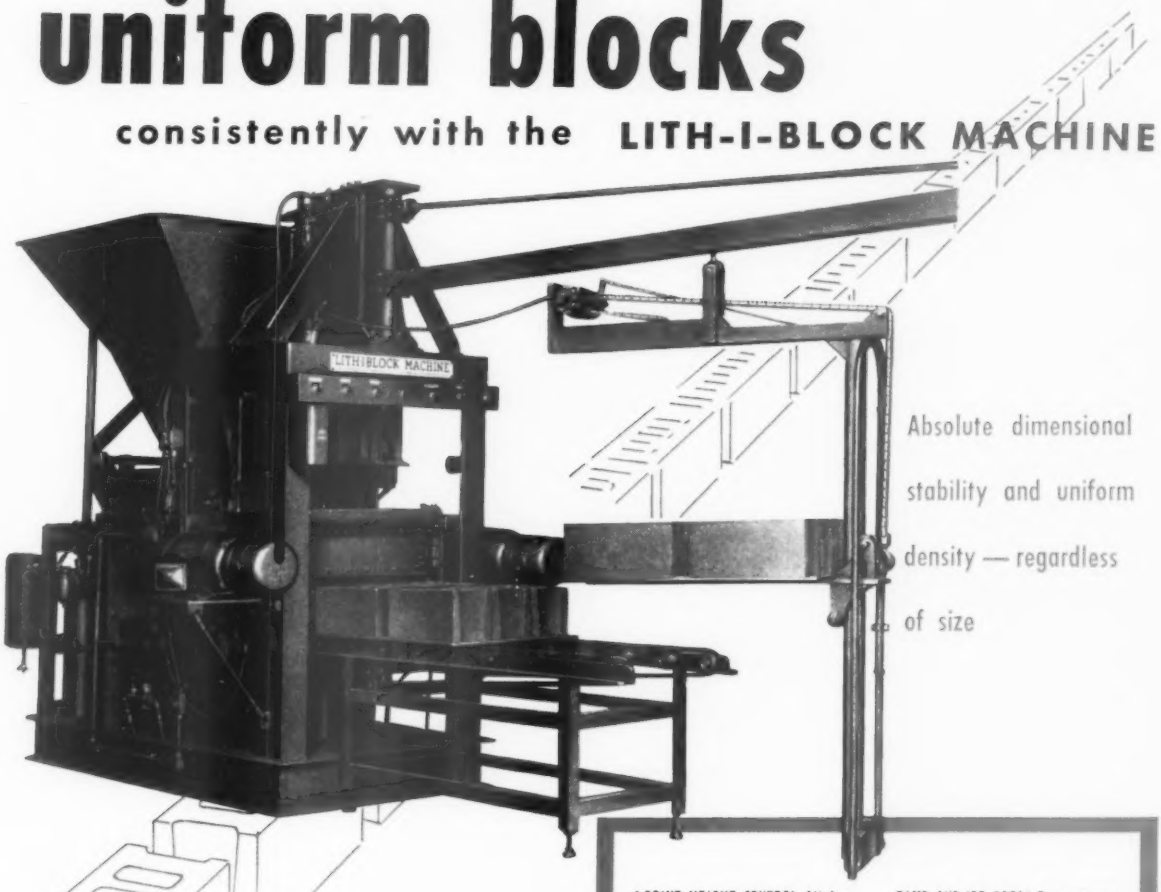
CP-8

INDEX TO ADVERTISERS IN THE CONCRETE PRODUCTS SECTION OF ROCK PRODUCTS

SEE INDEX OF ROCK PRODUCTS SECTION ADVERTISERS ON PAGES 267, 268

uniform blocks

consistently with the LITH-I-BLOCK MACHINE



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With LITH-I-BLOCK MACHINE you get a perfect finished product with each cycle. From the start right on through to the end of the batch every block is exactly the same height, the density is constant — top, middle and bottom. Sharp edges all around instead of feathered edges that distort the mason's line. You can rest assured that every Lith-I-Block will be square at every point. It is no wonder that contractors the country over are turning more and more to the Lith-I-Block building units.

4-POINT HEIGHT CONTROL All four corners of the block forming unit rigidly set to insure top and bottom surfaces parallel.

QUICK-CHANGE MOLD BOX Complete change-over, including strippers, can be made in less than twenty minutes.

SPLIT CYCLE CONTROL Production cycles may be stopped at any point or switched from automatic to semi-automatic or manual at any phase of the process.

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STANDARD PLAIN STEEL PALLETS With Lith-I-Block you need only one set of pallets for all shapes and sizes of block.

TAMP AND/OR PRESS Tamp at any frequency or simply weight press — or do both in the same cycle — assuring uniform texture throughout the block.

ADJUSTABLE VIBRATOR UNITS Independent of mold box; allows adjustment of speed and direction to provide right vibration for every aggregate.

CONVENIENT OPERATION Two sets of controls — one at finger tips of operator on Offbearer and another set on panel at front of machine.

4 OR MORE CYCLES PER MINUTE with sand and gravel — still more when running light weight aggregate.

All features available with either Model L-5 3-Block machine or Model L-3 2-Block machine.

SAVES YOU MONEY TO BEGIN WITH — EARNS YOU MOST IN THE LONG RUN

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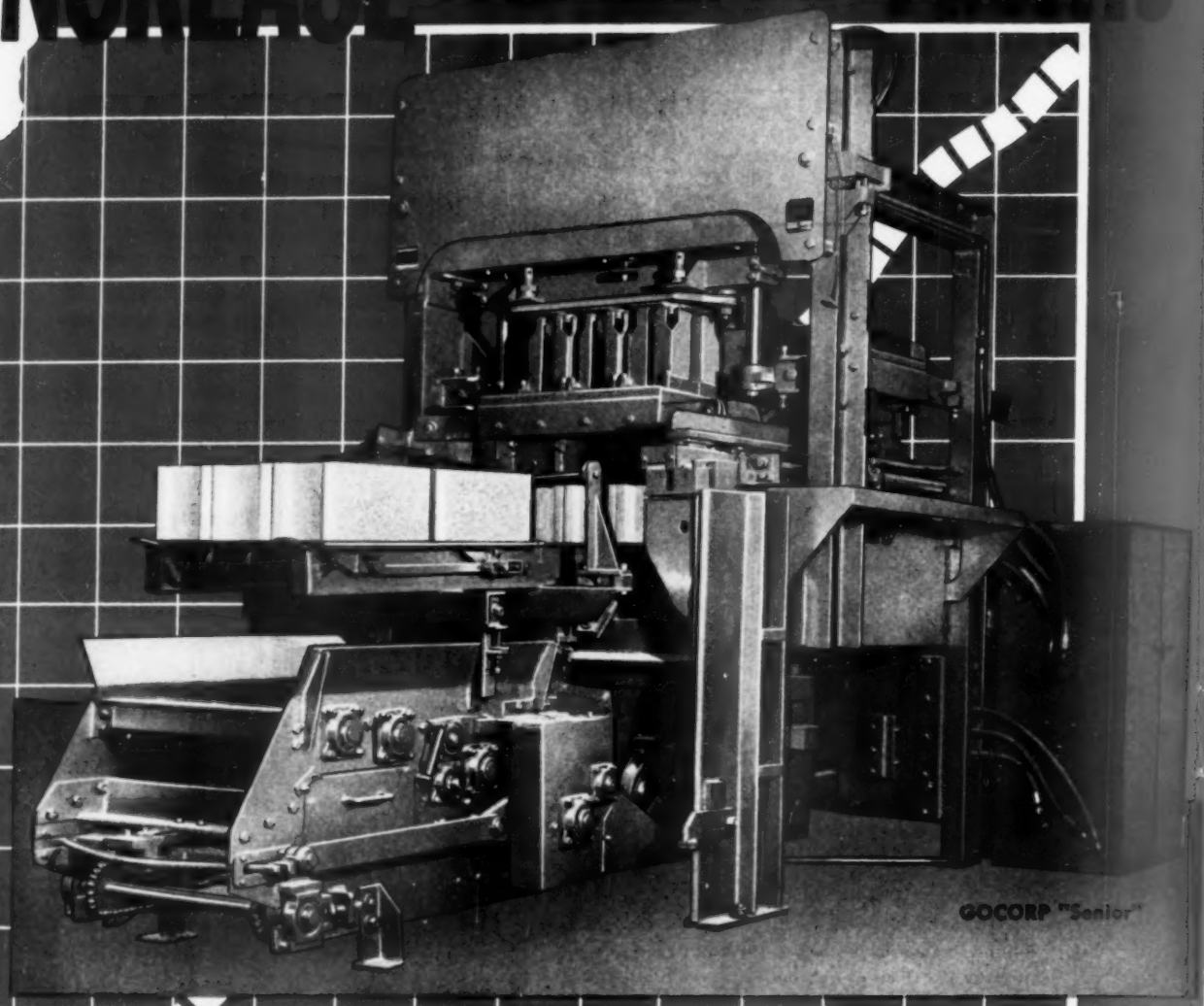


with a GOCORP

Because GOCORP Plain Pallet Machines (The King—8 at a time or the Senior—3 at a time, illustrated) mean ✓ a quality product that helps you [illegible] customers and repeat orders ✓ quantity production for lower *unit* production costs ✓ reduced maintenance and uninterrupted production allowing you to keep the profits you've made.

AND with a GOCORP there's no fear of obsolescence.

For complete information on plain pallet machines, batch mixers (12 to 75 cubic foot capacity), pipe and tile machines, or junior cored pallet block machines write or phone today.

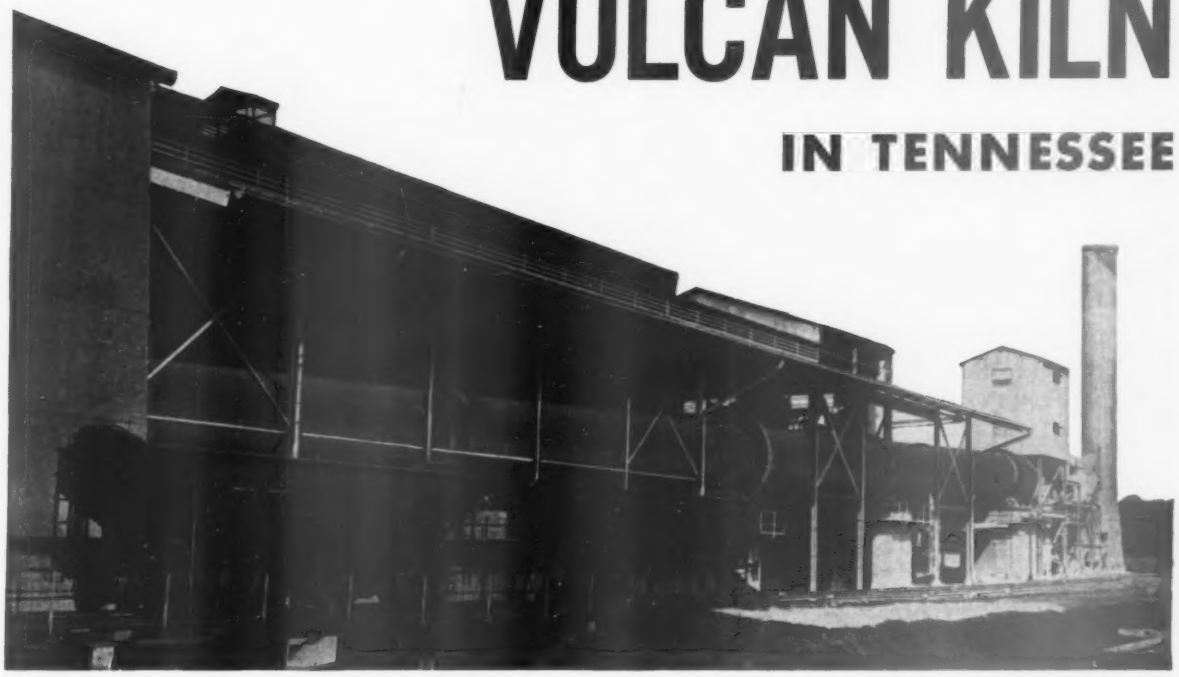
HERE'S HOW GOCORP DOES IT—

- **Direct Feed** from main supply hopper to mold (no old fashioned feed drawer) plus intense vertical vibration (pallet clamped to mold) assures a uniformly dense unit.
- **Sequence Operation** for easy adjustment and greater production. Under Machine Pallet Return—saves space and reduces labor costs with one man operation.
- **Hydraulic Drive**—Smooth trouble-free performance—reduces maintenance. GOCORP'S Johnny-on-the-spot factory trained men for help when you need it.
- **Advanced Design** gives you "Tomorrow's machine today."

GOCORP
ADRIAN-MICH.

[illegible] Adrian, Michigan

ANOTHER VULCAN KILN IN TENNESSEE



Repeat orders are the surest indication of satisfactory service. In 1928 a well-known Tennessee cement company installed two Vulcan rotary kilns, each 10 feet x 215 feet, for manufacturing Portland cement by the wet process. During nearly a quarter-century of practically continuous operation these two kilns have given, and still give, such satisfactory service that another Vulcan kiln has recently been installed to provide 60% additional capacity.

The new Vulcan kiln, shown above, is much longer (10 feet x 300 feet), thereby permitting higher overall efficiency and greater capacity. Other improved features include a heavily reinforced all-welded steel shell mounted on our latest-type supporting roller and thrust bearings; all of which are automatically lubricated and easily adjusted to compensate for wear and moderate misalignment.

The main drive unit is fully enclosed and the gasoline-engine auxiliary-drive unit is as fully enclosed as possible; to promote cleanliness and safety. Both drives provide an ample margin of power over any probable requirement and are designed for many years of trouble-free service.

Every part of every Vulcan Kiln is designed and built with an extra margin of protection against mechanical troubles of every kind and that's why long-time users often order additional units from us without competition. They know that any necessary difference in first cost will be repaid many times over in greater freedom from breakdowns, shutdowns, and other operating expense.

THIS BOOKLET TELLS WHY VULCAN KILNS ARE BETTER

and why they give more years of trouble-free service. Its 28 fully-illustrated pages are packed with specific information regarding the design and construction of Vulcan Rotary Kilns, Coolers, Dryers and other related products. No charge or obligation. Write for Bulletin No. A-442, giving name of your company.

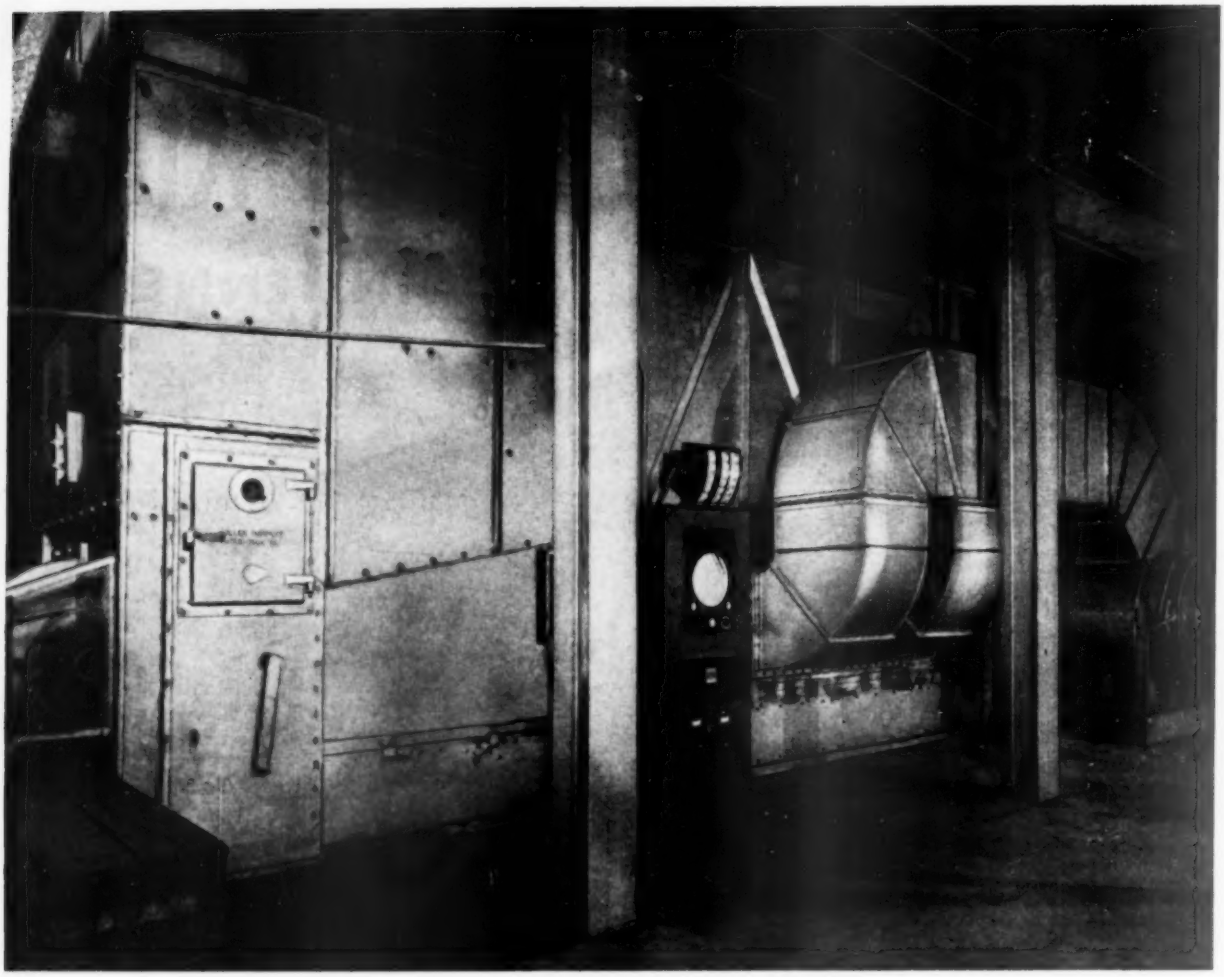
Vulcan Iron Works

Established 1849

WILKES-BARRE, PA., U.S.A.

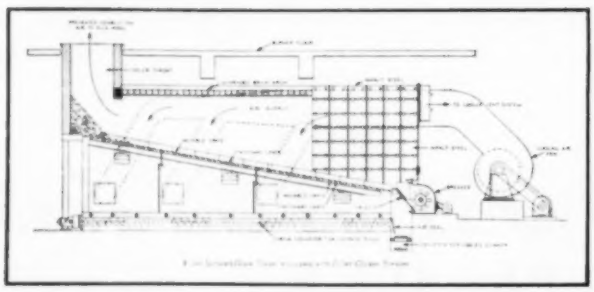
New York City Office, 50 Church Street

OTHER VULCAN PRODUCTS INCLUDE BRIQUETTING MACHINERY, ELECTRIC HOISTS, MINING MACHINERY, OPEN HEARTH STEEL CASTINGS, HEAVY SPECIAL MACHINERY AND ALL TYPES OF MODERN INDUSTRIAL LOCOMOTIVES. BULLETINS ON REQUEST.



Fuller Inclined-Grate Cooler . . . the cooler

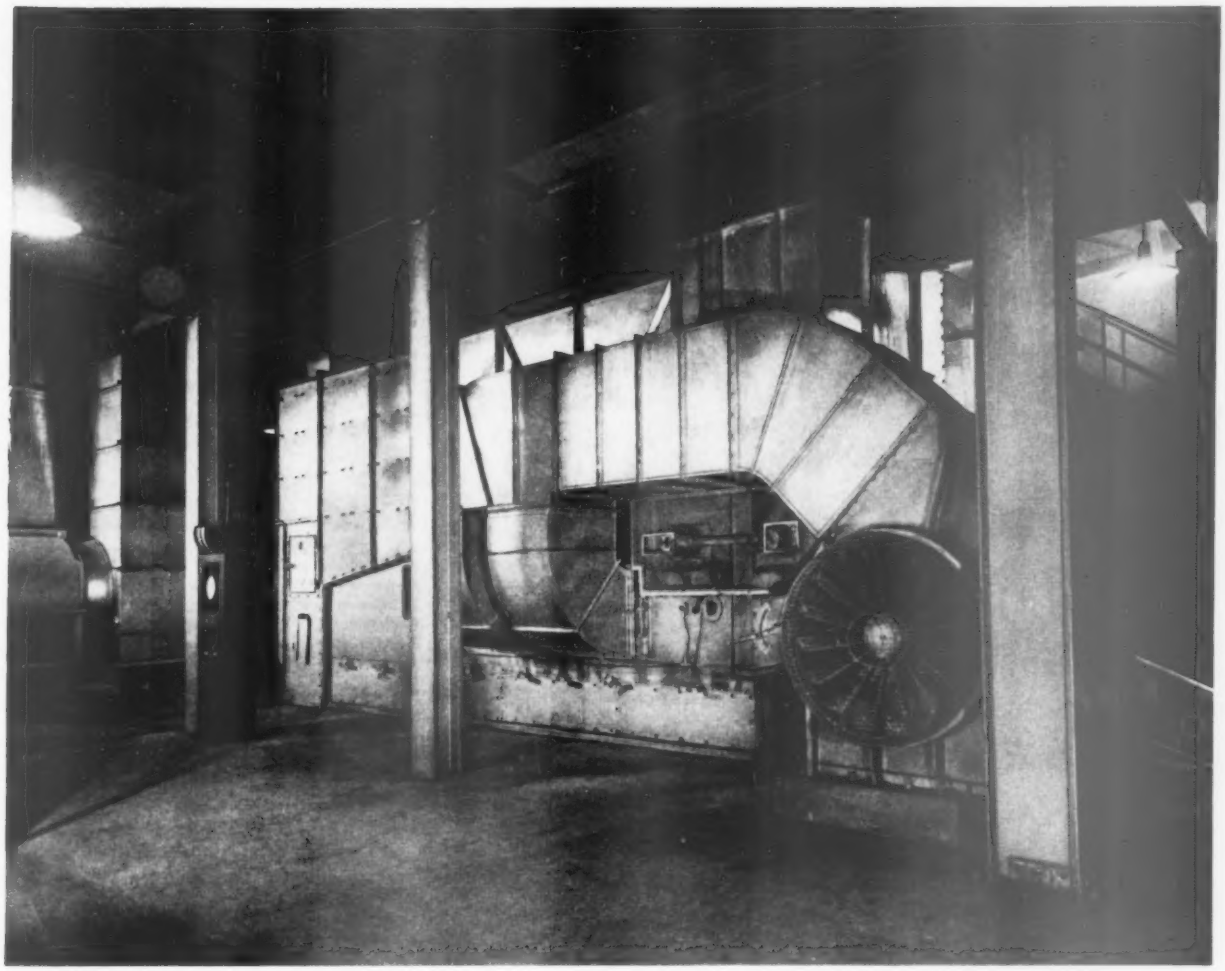
- UNIFORM AIR QUENCHING
- EFFICIENT HEAT RECUPERATION
- BETTER CLINKER GRINDABILITY



CO-29T-2302

It was only natural that the Fuller Cooler should become outstanding in the cement industry. Designed and built by engineers with intimate experience and knowledge of the industry, their aim was to produce equipment that would meet definite, peculiar requirements in the most satisfactory manner. Ever since the first cooler was installed, Fuller engineers have continually endeavored to improve upon its design and construction, with the result that a very large percentage of clinker coolers purchased and installed in the cement industry during the past few years has been of the Fuller design.

Fuller Coolers are handling, in addition to cement clinker, such materials as pebble lime, ores, dolomite, and iron nodules. Installed capacity is handling materials at a rate of approximately 138,700 tons a day. This record has been built on a basis of advanced and sound engineering . . . engineering that enables every installation to operate at maximum efficiency with minimum maintenance. Once a Fuller Cooler is installed, and additional cooling capacity is required, other Fullers are



with outstanding performance records

purchased . . . repeat business, a sure sign of satisfactory performance.

Fuel savings. Users of Fuller Coolers have reported savings as high as 25 percent, due to recuperated heat returned to the kiln or furnace.

Fast, effective air-quenching. This feature of the Fuller Cooler allows the user to obtain specific quality effects when this result is required.

Increased grindability of cement clinker. Laboratory tests and reports from users confirm this ability of the Fuller Cooler.

Why not take advantage of Fuller's many years of experience in materials handling and cooling. A talk with a Fuller Engineer may lead to more profitable operation in your plant.

Bulletin CO-5 illustrates and describes this equipment. Send for your copy today.

FULLER COMPANY, Catasauqua, Penna.

- LOWER FUEL COSTS
- HIGH-TEMPERATURE COMBUSTION AIR

BRANCH OFFICES: CHICAGO • SAN FRANCISCO • LOS ANGELES • SEATTLE • BIRMINGHAM

Like all PIONEER jaw crushers, the 42" x 48" has an all-welded steel base of double-wall, box-type construction. Design reduces weight, but strength is substantially greater than is possible with a cast steel base of the same dimensions.

Hydraulic process uses oil pressure to expand inner races of shaft bearings. This permits bearings to slide freely from shaft so that bearing check-up and maintenance become relatively simple. Shaft is 10' long, 14½" in diameter between bearings. Shaft stroke is 1¼".

Giant New Jaw Crusher Rated to Deliver Over 600 TPH at 13" Setting

Workmen are dwarfed by the 19,000 lb. pitman and 5200 lb. shaft assembly being lowered into place as PIONEER assembles the world's largest overhead eccentric jaw crusher. This 42" x 48" crusher reduces rocks in a 4 cu. yd. crushing chamber at a calculated capacity of over 600 tph with maximum jaw setting of 13". Minimum setting is 4". Length of moving jaw is 104"; stationary jaw, 90". Crusher was designed to reduce drilling and blasting costs.

Welded steel construction of the base allows crusher to be built with a total weight of less than 95,000 lbs. These features are important in preventing excessive maintenance cost: A patented closure between inner and outer bearings which makes it possible to place bearings closer together than on any other anti-friction bearing jaw crusher . . . thus greatly reducing shaft strain. Outer bearings saddle-mounted in the frame on precision-machined parts. Split-reversible jaw plates, cast from tough, alloyed manganese steel, designed to prevent cold flow and peening. Toggle plate safety device protects crusher when non-crushable material enters chamber.

Want the production reports on how this giant crusher can cut operating costs in mines and quarries?

Write now to

Pioneer ENGINEERING WORKS, INC.

Minneapolis 13, Minnesota

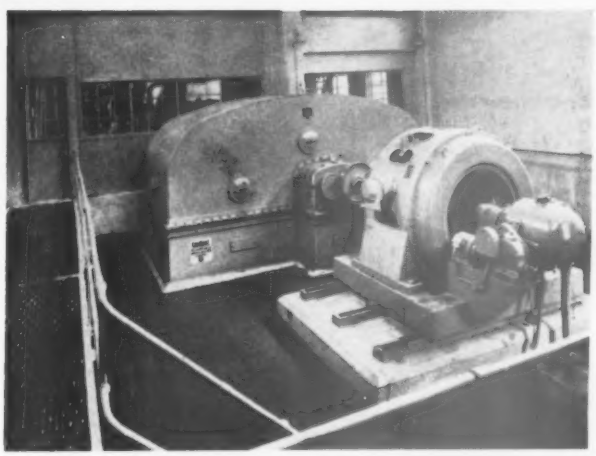
(SUBSIDIARY OF POOR & COMPANY, CHICAGO)

Ready to go. Giant crusher is ready for shipment to the U. S. Lime Products Corp., Las Vegas, Nevada. Two-unit base permits easy handling by standard equipment.

FLS Symetro Drives

Years of continuous, reliable performance at highest efficiency and negligible maintenance.

Over 7500 HP transmitted through Symetro gears direct to trunnions of raw mills in cement plant illustrated above.



Driving station for large clinker mill showing motor and Symetro gear in separate enclosure (right).

For Smidth Machinery apply to:

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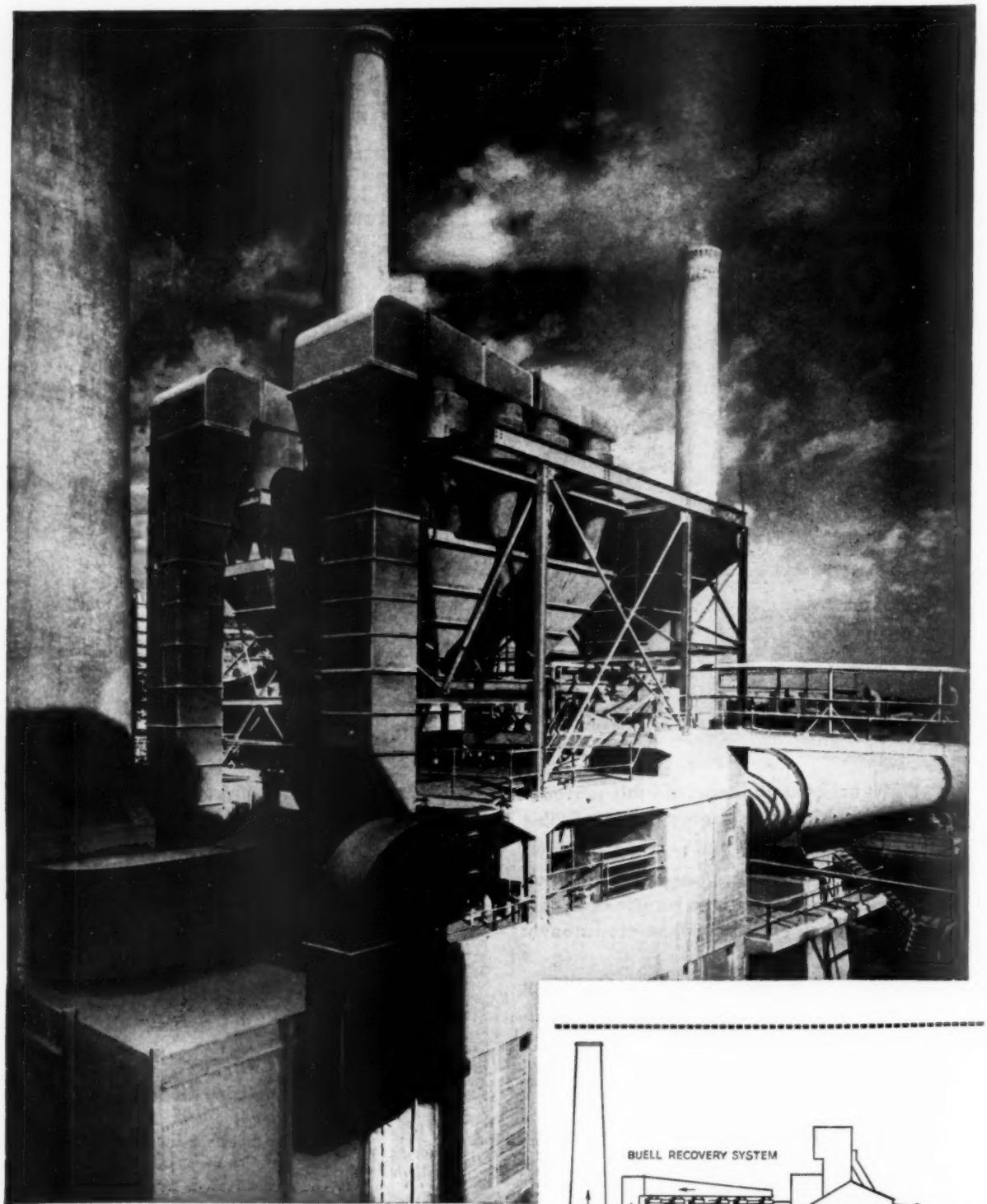
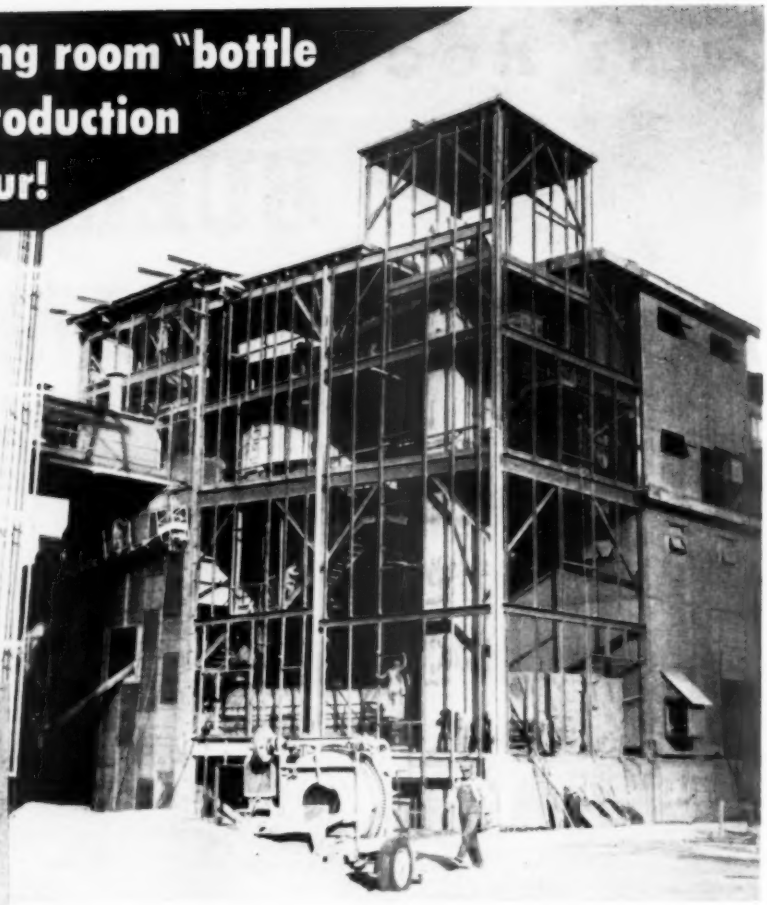
In Cement and Lime Kiln



Breaking a grinding room "bottle neck" increased production 110 barrels per hour!



Enlarging and modernizing the grinding room of this large cement plant provided a *gain in finished product* which by far outweighed the costs involved.

GUNITE...

One of many modern types of wall construction employed by Stearns-Roger in buildings which house industrial plants.

TAKE IT UP WITH STEARNS-ROGER

If any aspect of your plant is consistently retarding total output, let us investigate the possibilities of alterations, additions, or modernization to correct the problem.

We have engineered, designed, and constructed numerous complete cement plants and have modernized others in recent years.

Stearns-Roger

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They're licked before they start

Super-Tempered Precision Space Screens defy Abrasion, Vibration and Fatigue to do their worst. These durable screens stay tight and give extra long wear on the most punishing jobs because they're made of hard and tough super-tempered steel wire that's precision crimped and woven on powerful hydraulic machines.

Specify Super-Tempered Precision Space Screens and find out how they save you money in less downtime and longer life; greater tonnage output at lower cost. To order, write or phone our nearest sales office.

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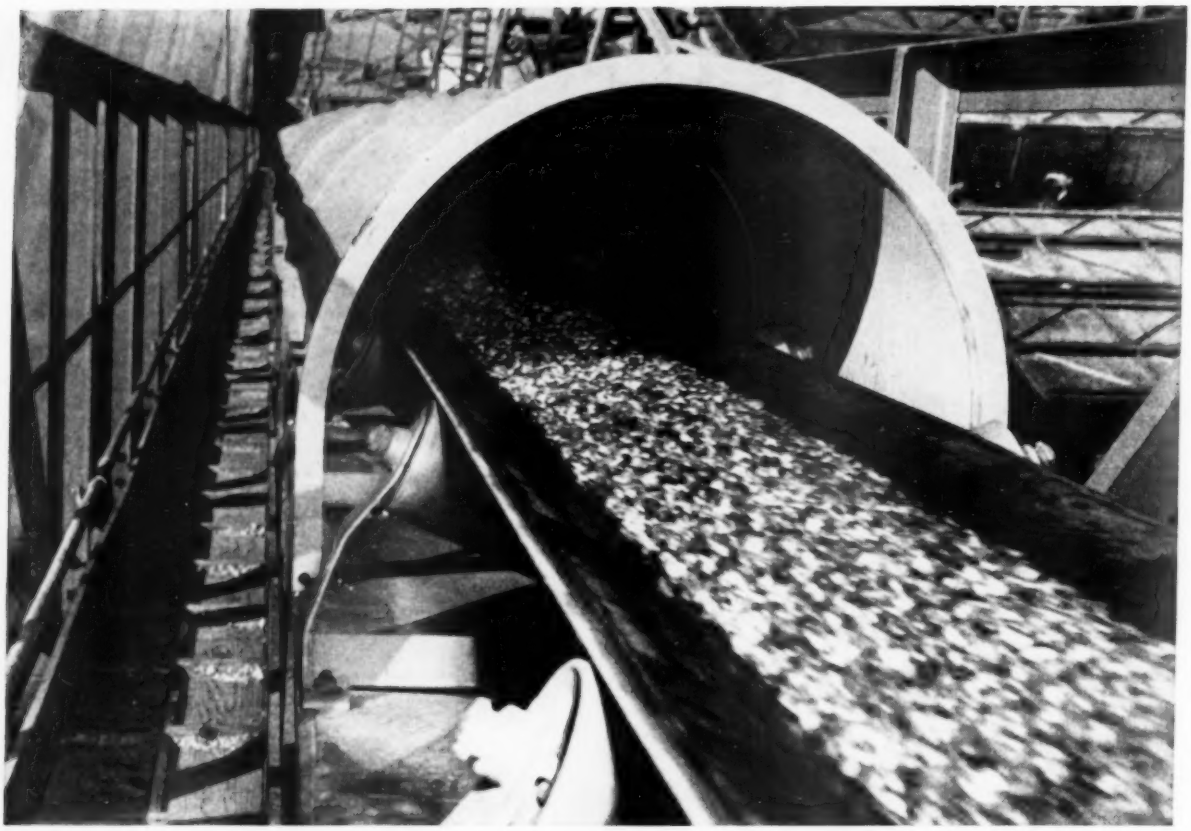
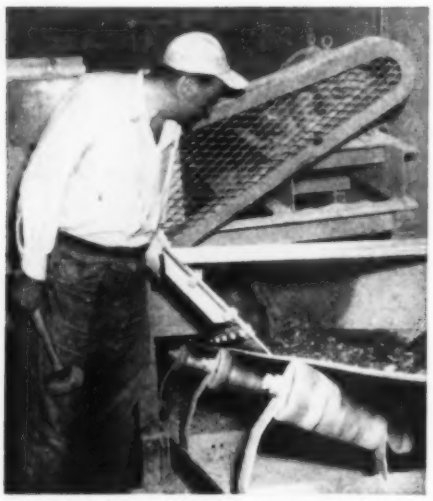


Basalt Rock Company reports . . .

Belt reinforced with Du Pont "Cordura" rayon carries 1500 tons per day . . . gives trouble-free service



Crushed rock being loaded on belt underground. This 24-inch belt, reinforced with "Cordura" rayon, hugs the center idler for better training and troughing throughout its 310-foot run.

Steady production at the Basalt Rock Company, Fontana, Calif., which makes concrete pipe, depends on the performance of the conveyor belt shown above. The belt, reinforced with Du Pont Cordura* High Tenacity Rayon, is used continuously for 6 hours each day . . . and running conditions include exposure to the heat of summer, and to winter sand and dust storms.

The company reports that this "Cordura" reinforced belt, manufactured by the Manhattan Rubber Division of Raybestos-Manhattan, Inc., has given highly satisfactory service under all operating conditions since its installation 9 months ago. It has carried an average daily load of 1500 tons of rock and sand—has needed no repair or maintenance to date.

The extra strength of Du Pont "Cordura" permits a belt that's thinner, yet stronger. And the *low stretch* of "Cordura" reduces expensive downtime for take-up and resplicing.

Write us for names of suppliers . . . and send for your free *copy of the new booklet "Mine & Quarry Facts About 'Cordura'." Address: Textile Fibers Department, Room 11504R, E. I. du Pont de Nemours & Co. (Inc.), Wilmington, Del.*

*REG. U.S. PAT. OFF.

Du Pont "*Cordura*" High Tenacity Rayon

STRENGTH AT LOW COST

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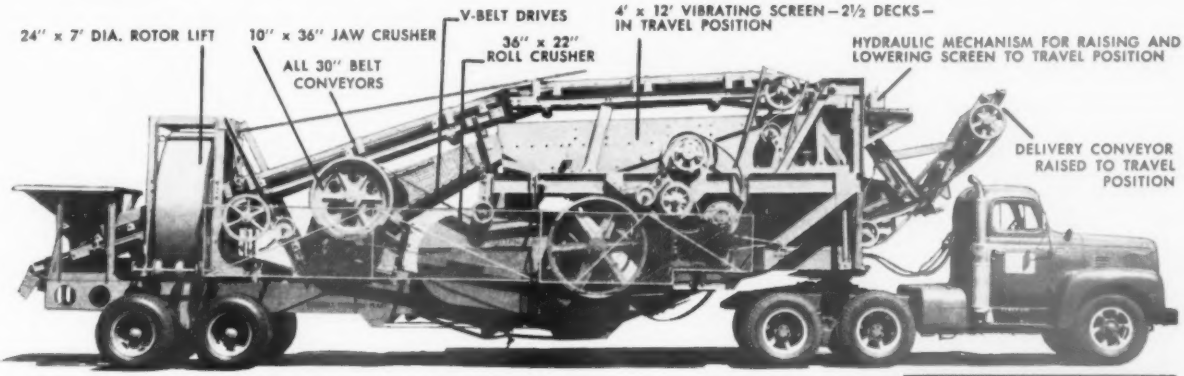
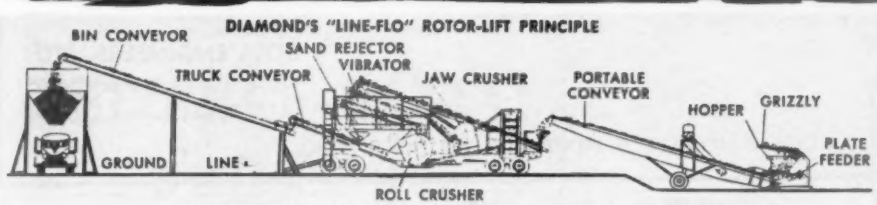
BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

ALWAYS READY FOR THE DAILY GRIND—*anywhere*

DIAMOND "77" "All American"

Portable CRUSHING and SCREENING PLANT





ASSURES SMOOTHER... MORE EFFICIENT... MORE ECONOMICAL PRODUCTION

Up to
450 tons per hour of ¾" aggregate
Not a guess, not an engineer's estimate nor an operator's dream — but actual reported on-the-job performance.

It puts you on the road to bigger profits

A 10"x36" jaw crusher, and a 36"x22" oversize star gear roll crusher, provide tremendous crushing capacity. The oversize 2½ deck screen (4' x 12'), set at an 18° angle assures the proper sizing of material for an uninterrupted flow through all decks.

And after a job has been completed in record time—as it will be—the screen deck can be lowered to travel position by means of a new hydraulically operated mechanism. Almost as soon, this easily portable and highly maneuverable DIAMOND 77 crushing and screening plant is ready to take off for its next profitable assignment. Find out all about the DIAMOND 77 "All American"—now!

SPECIFICATIONS

Overall Length	43'-5¼"
Overall Width	9'-0"
Overall Height (Operating)	15'-3¾"
Overall Height (Travel)	12'-6"
Travel Weight (Approx.)	64,000 Lbs.
H.P. Required (Sea Level)	130-160 H.P.
Wheelbase	20'-11" With Tandem Dolly
Number Of Front Wheels (Optional)	4 Dual Wheels—8-9x20—12 Ply Tires
Number Of Rear Wheels	4 Dual Wheels—8-9x20—12 Ply Tires
Jaw Crusher	10" x 36" (Roller Bearing)
Roll Crusher	36"x22" (Star Gear — Roller Bearing)
Vibrating Screen (Set at 18°)	4'x12'—2½ Deck
Rotor Lift Drum	24"x7' Dia.
Belt Conveyors	All 30" Wide
Screen Lowering Mechanism	Hydraulically Operated
Drives	V-Belt
Spline Shaft Drive From Power Unit at Side of Plant	
Capacity	175-225 Cu. Yds. Per Hr. (Based on 25% Oversize Material Passing 1" Screen)

OPTIONAL EQUIPMENT

1. Single or Double Axle Front Dolly
2. Sand Rejector
3. Chip Eliminator
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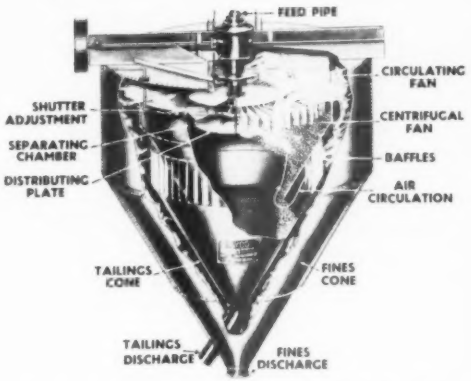

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GAYCO Separators are a vital factor in manufacturing high early strength cement, insuring a premium product of specified surface area and uniformity.

Consider these advantages of GAYCO:

- **Exclusive GAYCO sizing fan gives closer separations**
- **Range 60 to 400 mesh**
- **Undesirable oversize rejected from product**
- **Higher production because of complete removal of fines**
- **Cleaner tailings**
- **Slow speed for slow wear**
- **Quick and easy adjustments**
- **Equipped with Timken bearings**

Modernize *your* cement plant with GAYCO Separators for extra-efficient operation, with maximum output and profits.

Let Gayco engineers give you the benefit of their many years' experience.

UNIVERSAL ROAD MACHINERY CO.

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HERE'S why Link-Belt cast elevator buckets offer longer life, better handling. Special casting techniques assure uniform sections and smooth surfaces. Reinforced corners, lips, ends and backs provide maximum rigidity.

All six styles pictured above are readily available in malleable iron or Promal for mounting on either belt or chain. Aluminum and bronze can be furnished for special applications. Book 2465 gives complete ordering information, including sizes carried in stock. Ask your nearby Link-Belt office or distributor for a copy, or return the coupon below.

13,562

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Please send me a copy of Book 2465, "Link-Belt Cast Elevator Buckets."
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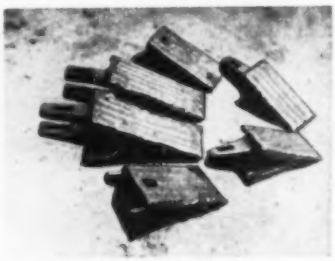
11½ to 13% MANGANESE NICKEL STEEL



Bucket teeth built up with "Manga-Kote" and then hard-faced with "Resisto-Loy".

Has all the advantages of tough, ductile manganese nickel steel weld deposits, yet runs as easily as mild steel electrodes.

"Manga-Kote" is ideal for building up large, bulky parts too heavy to position for down hand welding, such as bucket sides, tractor rollers, grousers, gear teeth and crusher rolls in portable crushers without removing rolls. Any number of passes can be made to attain desired height or build-up. Requires no Peening.

Hammers rebuilt with "Manga-Kote" for a fraction of the cost of new hammers will wear longer than new hammers.

Use "Manga-Kote" to build up worn equipment and then hard face with "Resisto-Loy" for higher production, longer equipment life and lower maintenance costs.

RESISTO-LOY CORPORATION Grand Rapids 7, Mich.

For Precise Gradation Control, use

AUTO VORTEX CLASSIFIERS

with their *exclusive* Charles E. Wood Company

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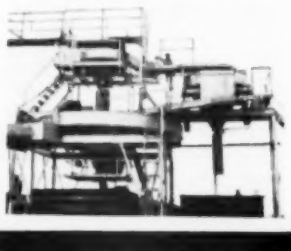
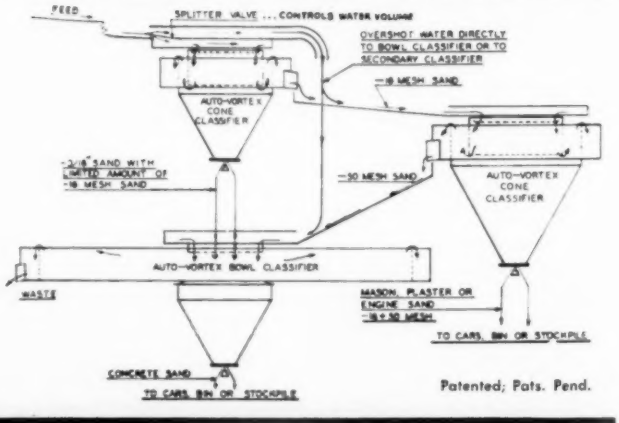
The use of the SPLITTER VALVE permits control of water volume and hence control of gradation of the products. The fines, overflowed from the cones, are captured economically by the Auto-Vortex Bowl Classifier to meet state or ASTM specifications. This arrangement is favored by many plants for removing the bulge or excess of middle sized sand, which itself then becomes a valuable product.

This Texas plant is one of many successful users of two Cones, a Bowl, and the Wood Company Splitter Valve. Versatile Auto-Vortex Classifiers may answer your gradation problems. Write for details.





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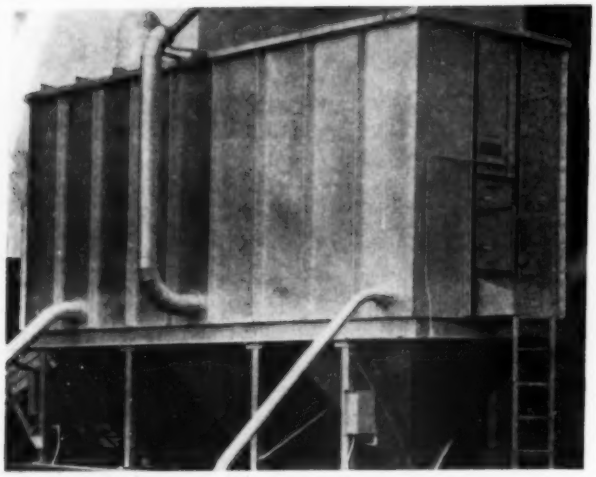

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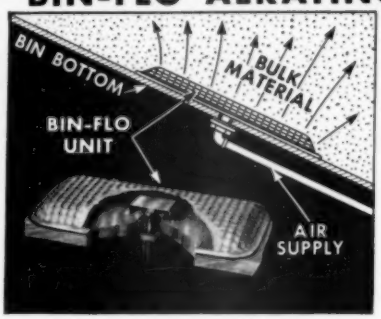

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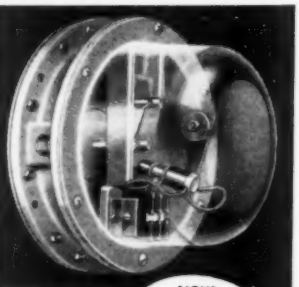

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1—Bucket elevator 24"x36" Buckets, mounted on steel chain 122' centers with drive.
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1—2" Moyno Pump. 3" & 4" Bingham rubber lined Slurry Pumps. 2", 3" & 5" Model "C" & "K" Wilfley Pumps.
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Sauerman 1½ Cu. Yd. Slackline Cableway for 850 Ft. Span, Mast, 100 H.P. Two speed Double Drum Elect. Hoist, Roller Bearings, Operating Cables, Guy Cables, Bridge Cable with necessary Fittings and 1½ Cu. Yd. Cableway Bucket. Purchased New March 1950. A-1 Shape.

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ANY WIDTH or LENGTH

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5' x 50' x ½" dryer. 7' x 120' kiln.
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IMMEDIATE SHIPMENT

BOILERS

12—304 HP Kewanee Firebox Boilers, Model 590, 125 PSI, with oil burners & soot blowers, ASME.
4—150 HP HRT Boilers, 150 PSI, gas fired, ASME. 50 HP.
Titusville, 150 PSI.

CRUSHERS

18"x36" Jaw, Traylor, Bulldog.
14"x16", Bartlett & Snow, 2 roll.
48" Symons, vert. disc.
42"x14" Traylor, 2 roll.
28"x24" Williams Impact Crusher.
18"x18" Jeffrey, single roll.
42" Raymond, 3 roll, high side.
50" Raymond, 5 roll, high side.
Raymond No. 1, double whizzer complete.

BUCKET ELEVATORS

3—35'-65' ce., 12"x6" buckets, Cent.
2—40' ce., 6"x6" buckets, Centrifugal.
4—20'—31' ce., 6"x4" to 8"x6" buckets.
1—50' ce., 8"x5" buckets.
1—44' ce., 15"x12" buckets.

KILNS—COOLERS—DRYERS

9' x 80' x 5⅝" Allis Chalmers.
8' x 125' x ¾".
7' x 160' x 5/8" (2).
7' x 120' x 5/8" (2).
7' x 45' x ½" Link-Belt.
5' x 67' x 5/16".
5' x 30' x ⅜" Ruggles-Cole.
4'6" x 50' x ¼" with lifters.
4' x 30' x ⅝".
310-16 Roto-Louvre.

SCREENS

4' x 10' Seco, double deck.
4' x 7' Tyler-Hummer, single deck.
3' x 8' Link-Belt, double deck.
2' x 4' Aero-Vibe with motor.

MISCELLANEOUS

14"x13" Worth. Compr. 628 cfm, 100 psi.
No. 3 Clyde Lime Hydrators.

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Continuous 14" and 12" bucket elevators.

Open inclined 14" bucket elevator 60' center.

Enclosed 10" bucket elevator 60' center.

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Enclosed inclined 6" bucket elevator 39' center.

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Elevator chain, buckets and parts for elevator.

Robins double roll crusher, 18" x 24".

Bonnet double roll crusher, 24" dia. 30" face.

Penna. SXT-8 hammermill.

Sturtevant 00 Fine crusher with 2 hp motor.

Prater size 5 pulverizer with 10 hp motor.

Link Belt Apron Conveyor, 24" x 46'.

Apron conveyor 18" wide 16' long.

Jeffrey 40" wide SLAT conveyor 16' long, new.

Screw conveyors, Feeders, Weightometers.

Symonds 2 deck 3'x10' vibrating screen.

Hummer vibrating screens, type 31 and 37.

Selectro enclosed single deck 4'x6' vibr. screen.

New Universal Vibrating Screens.

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Jaw crushers and Hammermills.

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NEW TROUGHING IDLER CONVEYORS

We take our loss on our stock of short length belting and previous model idlers. You save as much as 50% on the BONDED CONVEYOR SPECIALS listed, with conveyor belting in two pieces. Conveyors are equipped with 5" roll diam. idlers and return rolls, 20" diam. head pulley and 16" diam. tail pulley mounted on 2-7/16" diam. shafts. Belt is new, 4-ply, 28 oz., 1/16" top rubber cover x 1/32" bottom cover and is fresh stock made by leading manufacturers.

Remember, You Save Up to 50%

Belt Width	Length of Conveyor	List Price	Sale Price
18"	25'	$1229	$ 658
18"	45'	1839	960
18"	85'	3209	1581
18"	100'	3704	1814
24"	25'	1322	739
24"	45'	2062	1085
24"	100'	4097	2037
24"	130'	5207	2606
30"	25'	1421	806
30"	65'	3101	1617

Other lengths and belt widths at bargain prices.

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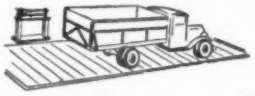
For stationary and portable applications. Scales have steel lever system complete with structural steel weighbridge. Capacities to 50 tons. Recording beams available.



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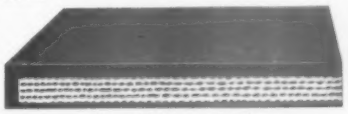

Width	Ply	Top Cov.	Bottom Cov.	Duck Carcass	Price
16"	4	1/16"	1/32"	28 oz.	$2.45/ft.
18"	4	1/16"	1/32"	28 oz.	2.50/ft.
24"	4	1/16"	1/32"	28 oz.	3.23/ft.
30"	4	1/16"	1/32"	28 oz.	3.97/ft.
20"	5	3/32"	1/32"	28 oz.	3.95/ft.

Additional widths and plies available at low prices. Write for free sample.

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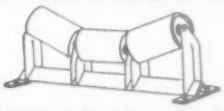

3-roll, 5" diameter Troughing Idlers for

16" belt.....$17.25 24" belt.....$18.75
18" belt..... 18.00 30" belt..... 19.50
20" belt..... 18.25 36" belt..... 20.25
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All steel. Interchangeable with other well-known makes. Replaceable ball bearings. Either sealed type (pre-lubricated) or with alemite fittings. Rust proof ball races. Maintenance is negligible.

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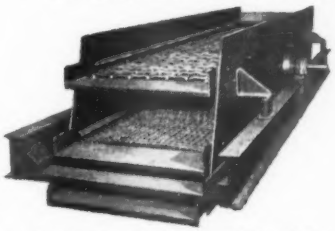

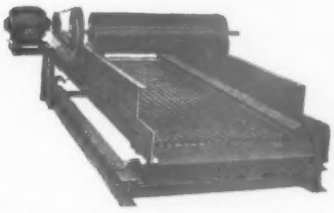

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FEATURES: 25 ton lifting capacity. Powered by Cummins H.P. 600 Diesel Engine. 55 ft. Lattice type boom. Clamshell Bucket. 8 wheel undercarriage. Completely overhauled, will stand rigid inspection. Guaranteed.

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OVERHEAD ELECTRIC CRANES: One 8 ton, 54′ span; one 7 ton, 75′ span; 4 motor, bucket operating, 3 phase, 60 cycle, 440 volt.

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LOCOMOTIVE CRANE: Link Belt 25 ton capacity, standard gauge, gasoline powered, cast steel trucks, air brakes, with or without 1¼ yd. Williams clam shell bucket, thoroughly modern, excellent condition. Located Minnesota. For sale or rent.

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DRYER or KILN: One 11′ x 75′, single shell.

PULVERIZER: Hardinge 5 ft. x 22″ Ball Mill complete with motor driven disc feeder. 30 H.P. motor and control.

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CRUSHERS: Gyratory 30″, 36″, 42″, and 48″. Nos. 12, 10, 9, 7½, 6, 5 Allis-Chal. and others.
JAW TYPE: 24x36, 25x40, 28x36, 40x48, etc.
CONE TYPE: Symons 2, 3, 4 and 5½′. No. 36 Telsmith. Also Kennedy 19, 25, 37 and 49. Traylor 1′8″ and 2′4″ TY. Newhouse 7, 10 and 14″. Steadman 24, 30 and 36″ Impact. Allis-Chalmers Ty. R.
ROLLS: Allis-Chal. 72x30, 54x24, 54x20, 40x15 and 18x10. Pioneer 18x30. Universal 16x24. New Holland 24x16 and 16x16. McLanahan 18x24 and 18x30.
HAMMERMILLS: Williams Nos. 2, 3, 4 and 6. Day Nos. 40 and 70. Gruendler 2XB and 3XB. Dixie 2040, 3050 and 5040, and others.
MILLS: Hardinge 3′x8″, 6′x22″, 6′x3′ and 8′x4′. Kennedy 4x8, 5x6, 5x11. Marcy 4x5, 6x4, 7x16. Raymonds, Sturtevants and others.
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1¾ yd. Manitowoc 3000A diesel crane.
½ yd. Link Belt LS50 Backhoe-Crane.
30 ton Ind. Brownhoist Gas Loco. Crane.
25 ton Orton diesel Loco. Crane.
65 ton Porter Diesel-Elec. Locomotives.
44 ton GE Diesel-Elec. Loco., new 1942.
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30 yd. Western & Koppel Air Dump Cars.
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1200 CFM Ing. Rand XRE, 200 HP Compr.
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Schield-Bantam "M49" ⅜ yd. Trench Hoe, mounted GMC 6x6 Truck.
Insley "K12" ½ yd. Used Dragline, 30′ boom.
Insley "K12" ½ yd. Used Trench Hoe.
Osgood "200" ½ yd. Trench Hoe.
Manitowoc "2000" Used Shovel Attachment, complete.

TRANSIT MIXERS

Jaeger 2 yd. Hi-Discharge Transit Mixer (1948) mounted White 1946 WA20 Truck.
Rex 2 yd. Hi-Discharge Moto-Mixer with Int. L-180 Truck.
Rex 3 yd. Hi-Discharge Moto-Mixer with Int. L-170 Tandem Truck.
Ransome 3 yd. Hi-Discharge Mixer, unmounted.
Jaeger "HCS" 3 yd. Hi-Discharge Mixer with Chevrolet Tandem Truck. Reduced.
Jaeger 3 yd. Hi-Discharge Transit Mixers (2), mounted on White WB2264 Tandems.
Challenge 5 yd. Hi-Discharge Transit Mixer, mounted Int. L-190 Tandem.

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Diamond "1536" Used R. B. Jaw Crusher.
Caterpillar "D8800" Used Diesel Power Unit.
Haiss "75-W" Bucket Loader, 1950 Model, Rubber-Tired.

Note: This equipment is in our yard or within 40 miles.

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10′ Gayco & Sturtevant AIR SEPARATORS.
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Aus. West. 48″ x 18′ Revolving SCREEN.
West. 108E x 7′ Coal STOKER.
Two 40 ton, 50 ton, one 105 ton steel BINS.
36″ x 25′ Eagle screw, 24″ x 18′ Log WASHERS.
40 ton OET Trolley Crane.
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Twelve 16 yd. Easton std. ga. Side Dump Cars.
3—5 ton Bflo. Spfld. tandem ROAD ROLLER.

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2—8'x125' Vulcan, 5/8" shell.
2—7'x160' Vulcan, 5/8" shell.
2—7'x120' Vulcan, 5/8" shell.
1—7'x45' Link Belt, 1/2" shell.
1—4'x30' F. L. Smidth, 3/8" shell.
6—6'x25', 6'x30', 6'x40' steam tube.
1—5'x67' Reeves, 5/16" shell.
1—6'x35' Allis Chalmers, 1/2" shell.
1—5'x40' Cummer, 3/8" shell.
1—4'6" x 50' Vulcan, 3/8" shell.
1—4'6"x30' Louisville, 1/2" shell.
2—4'x20' Cummer, 5/16" shell.
1—3'x25' Louisville, 3/8" shell.
2—3'10"x16' Link Belt Roto-Louvre.
1—2'7"x8' Link Belt, Roto-Louvre.

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2—Raymond High Side Mills 3 and 5 roll.
2—#40, #10 Raymond IMP Mills.
2—Raymond #1 Pulverizers with 6' double whizzer separators.
5—Hardinge 4½'x16", 5'x22", 6'x22", 6'x 48", 10'x48".
3—Patterson 6'x8' Ball Mills.
2—Abbe 5'x8'6", 5'x22', Silex-Lined Tube Mills.

CRUSHERS

1—Symons 4' Cone Crusher.
1—Traylor 56"x24" Crushing Rolls.
1—Allis Chalmers 36"x48" Jaw Crusher.
10—Jaw Crushers 5"x6" to 24"x36".

SCREEN SEPARATORS

6—Tyler Hummer Screens 3'x5', 4'x5', 4'x7', 4'x10', 5'x10', 4'x15'.
1—Seco 4'x10' double deck Screen.
1—Link Belt 3'x8' double deck Screen.
5—Rotex 40"x84", 40"x120".
3—Air Separators 6', 8', 10', 14'.

MISCELLANEOUS

2—Chicago 14"x7" Air Compressors 434 CFM.
2—Oliver Rotary Dewaterers 8'x4'.
1—Complete Lime Hydrating Plant.
12—Bucket Elevators 20' to 90' centers.
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1—Type 30 New Holland Impact Crusher.

1—Pair New Holland 16" x 16" Rolls (Lot spare shells & parts.)

2—New small Swing Hammer Mills, 5½" x 8" feed.

1—12" Enclosed Cent. Disc. Elevator, 78' centers with Motor. Heavy case.

1—Magnetic Separator, Dings - Rowand - Wetherill. 100,000 Ampere Turn. 18" Endless Belt, 3 Cross Belts, Gear Head Motor Drive with Motor Generator. Unit complete. Can be seen operating.

JOHNSON & HOEHLER, INC.
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SPECIAL CRUSHERS!!

Pioneer 40x22 roll crusher Diesel powered.
Cedar Rapids 40x30 Hammermill Twin GMC Diesel.
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Pennsylvania C-4-30 Reversible Hammermill.
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Buchanan 36x42" Jaw Crusher.
Superior McCulley No. 18 Gy. Crusher, 36" opening.

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Ellicott 12"x10" new pump with new V-12 885 HP Diesel engine. Port. steel hull.
Ellicott 8" with cutter. Diesel Hull 48'x18'x3'6".
8" Hydraulic. Diesel. On 32'x8' steel pontoons.
Amaco 10" Diesel power portable. Excellent.
6" portable Diesel complete with cutters, etc.
8" H-P twin Diesel drive. Complete.

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Erie Strayer portable complete 30-40 yds. hr.
Erie GA, 36 yds., 3 compts 2 yd. bat., 25' bag hop.
B-K 100 tons 3 compt aggr. two 450 bbl. cement silo.
Noble CA-155 fully automatic 150 tons 5 compts.
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Johnson 150 yds. new 1950 3 compt. aggr. one cement ground silo 500 bbls. two 28-S mixers.
Johnson 55 yds. 5 compts. aggr. and cement 1050 bbls. silo.
Fuller-Kinyon Model H Port. cement conveyor.
NEW F-8 100 ton agg. bin 3 compt.
NEW F-8 400 bbl. cement bin complete.

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Gramm 125 bbl. Baughman tandem axle. New 1951.
Gramm 100 bbl tandem axle air slide. New 1951.

CRUSHING PLANTS

Cedar Rapids Portable Super Tandem, excellent.
Austin Western port. Model 101. New 1953.
Pioneer WA-300, crushing, washing, screening.
Cedar Rapids AAA Port. Primary crusher 20x36.
Cedar Rapids 40x33 Port. Secondary, Diesel.
Cedar Rapids Portable Master tandem.

CRUSHERS

JAW: Acme 10x20, 14x26, 14x28, 10x42, 16x32, 18x32, 25x40, Eagle 20x36, Diamond 24x36". Cedar Rapids 10x20, 20x36, 25x40, Farrell 10x20, 13x30, 14x36, 18x36, 36x48, Buchanan 36x42, Good Roads Reliance 15x30, Traylor 18x36, 24x36. Allis-Chalmers 30x18, Good Roads 10x30, Telsmith 18x32, Champion 1030, 1040, 1236, 1530.
GYRATORY: Allis-Chalmers-McCully, 6", 7½", 8", 9", 12K, 20", 30", 42", 14", Newhouse, 24", 36", Gyrasphere, 18", 28". Intercone Telsmith, Telsmith 5H, 10-B, 13-B, 16-B. Kennedy Van Saun 7, 19, 25½-S, 37. Traylor Ty 1'8", Ty 2'4", T-4½".
ROLL: Cedar Rapids 40x20. Diamond 40x22. Pioneer 30x18. Telsmith 24x16. Pioneer 30"x18". New Holland 24x16.
HAMMERMILL: Size 4 Williams Jumbo, Pennsylvania 8X2, 22x22. Cedar Rapids 20x33. Jeffrey 36x42, Jeffrey 36x24, 36x40.
BALL MILL: Hardinge 10'x48", K.V.S. 6'x8' Type M Air Swept J-H 6'x6', Hardinge Conical 6'x22". Colorado Iron Works 5'x6'; Marcy No. 64½. Hardinge conical 10'x36".
ROD MILL: March 2'x6', 3'x6'. Allis-Chalmers 4'x8', Hardinge No. B 206. Marcy 8'x12'. Hardinge 8'x22".
CONE: Symons 2' and 3' coarse bowl 4' short head.
TUBE MILL: Smidth 5½x20, K.V.S. 4'x7', Traylor 5'x22'.
DRIERS: Vulcan 4½x50', others 7'x20', 6'x80', 7'x70', 6'x40' and Cedar Rapids 60"x24'.

SHOVELS—CRANES—DRAGLINES

P&H 955 ALC Crane 2½ yds. 130' bm. 1951.
P&H 655-B, 1½ yd. Diesel Crane, 60' bm.
P&H 255-A, ¾ yd. Shovel-Crane, Diesel.
N-W 80-D 2½ yd. Dragline. Diesel. 100' boom.
N-W Model 6, 1½ yd. Diesel Shovel.
Northwest 80-D Diesel Shovel 2½ yd. New 1951.
Lorain L-820 2-yd. Shovel-Drag-Crane 100' Bm.
Lima 1201, 2½ yd. Diesel Shovel.
Manitowoc 3500, 2½-yd. High Lift Shovel.
Buc-Erie 54-B Diesel Shovel, 2½-yd.
Manitowoc 3500 Dragline 140' boom, new 1950.
Northwest 25 Diesel, ¾ yd. Shovel.
Lorain Model MC 414 Moto-Crane 80' boom.

SCREENS

Telsmith heavy duty washer 60"x13'.
Simplicity 4'x10' four deck.
Symons 4'x14' double deck.
Tyler 4'x10' two deck heavy duty, motor, Gen. Set.
Telsmith 5'x12' dbl. deck elec. motor.
Cedar Rapids 4'x12' dbl. deck elec. motor.
Pioneer 4'x12' 2½ deck elec. motor.
Puisator 4'x8' four deck.
Acme 5'x24' Rotary Scalper elec. motor.

TRACTOR - TRAXCAVATORS FR. END LOADERS

2 Cat. D8 Angledozers with DDPCU rebuilt.
Int. TD-18A with H-E Bulldozer.
Int. TD-24 with H-E Cable Bulldozer.
All-Chal HD10 Angledozer, Hydraulic.
Hough HF, ¾ yd front end loader 1952.
Int. TD-9 with Buc-Erie 1 yd dozer shovel.
Cat. D4 Traxcavator with 1 yd. bucket, hydraulic

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4—4½ yd. Jaeger high discharge.
3—5½ yd. Ransome high discharge.
5—4½ yd. Rex high discharge.

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American 30 ton Guy Derrick 106' boom, 116' mast.
American Terry 20 ton Guy Derrick, 100' boom.
Clyde 30 ton stiff leg 90' boom.
Guy Derrick, 15 tons, 115' mast, 105' boom.
American 25 ton stiff leg derrick, 90' boom.
Special 35 ton stiff leg derrick, 100' boom.
Nat'l Bridge 30 ton Guy Derrick, 100'.
American 30 ton stiff leg, 100' boom.

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Barber-Greene Model 845. Complete.
Hetherington-Berner Model M-12 1500# Pugmill.
Madsen 4000# Complete. New 1951. Excellent.
Overmander Monotrole Bit. Mixing Plant, T-34.
Hetherington-Berner Moto-Paver.
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Monotrol complete plant. Three years old.

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Sauerman slack line 1¼ yd.; electric 90' mast.
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Sauerman 1 yd. with Waukesha gas hoist.

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1—10'6" D x 112' L Rotary Kiln.
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60 FT. CRANE BOOM
1 Latticed steel crane boom 60 ft. $500.

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36x24 Jeffrey type B2 & 75 H.P. Motor.

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15 x 36 Gruendler Jaw Crusher.
15 x 36 Diamond Jaw Crusher.
10 x 20 Indiana Jaw Crusher.
13 x 17 Eagle Hammer Mill.
7 x 13 New Holland Hammer Mill.
3 x 10 3-Deck Pioneer Screen.

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Danville, Kentucky

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Gasoline driven oil field hoist ideal for drag lines. 565 cu. ft. slow speed Allis-Chalmers gas engine, multiple line speeds from 21 ft. per minute with 52,000 lb. bare drum pull to 1000 ft. per minute with 2100 lb. bare drum pull. Two drums.

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Telephone Fletcher 3803

FOR SALE

Bucyrus-Erie 120-B electric dragline, mounted on caterpillars; 100 foot boom; 4¾ cubic yard bucket. Has recently been reconditioned and in excellent condition, has been used mostly for rehandle. Reason for sale: Less rehandle in new coal pits and have two other machines. Specifications and photographs sent on request.

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Colstrip, Montana

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Stainless Steel Rotary Dryer

Link Belt Co. 5'2" x 16' No. 502-16, with all auxiliary equipment—Roto Louvre type.

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1—Lith-I-Block—1 yr. old.
1—Lith-I-Block—excellent condition.
80 racks & pallets. 2-block machines.
1 air compressor—3 stage.
Molds for 4-6-8-12 ¾-½-brick, pier, bull-nose & chimney blocks.
Both machines in operation at present time.

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Used Sand Washer, Drag-type, complete with new belt, original 10 H.P. motor, drive, etc. Excellent operating condition, and priced to sell.

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Wanted Machinery or Plant

Including Rotary Kilns, Direct Heat Dryers, Pulverizers, Crushers, Ball Mills, Vibrating Screens, Power Shovels and Cranes, Bucket Elevators, Conveyors, Filters, Diesel Engines.

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WANTED

Assistant Plant Superintendent to take charge of large Concrete Block Plant. Prefer experience with Besser Machines. Good opportunity with highly progressive organization.

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Model "12" Multiplex mixer. Complete with motor & controls. Good condition, installing larger machine.

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WANTED

Supervisors with gypsum plant experience for location in western United States. Submit full details of education, experience, references, and salary required.

BOX M-38, ROCK PRODUCTS
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FOR SALE

Sauerman Brothers 3-wheel carriage, cable saddle support for head mast, 1200 feet 1⅛" wire rope, used about one year.

DELANO GRANITE WORKS, INC.
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ELECTRICAL MACHINERY

Motors and Generators, Controls and Repair Parts. Large Stock. New and Rebuilt. Guaranteed Expert Repair Service. Send us your inquiries.

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1—3' x 6' Grizzly Feeder #5 HM 4 power Unit 3 Phase, 60 Cycle, 220 Volt with 3½' opening. Bought new in 1949.

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One (1) ¾ yd. Marion Shovel. 331M-S/N 8751. Fine Shape. Can be seen working—Caterpillar Engine—Price $8,500.

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Raymond 3-Roll High Side Mill

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BOX 6, RHEEMS, PA.

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40 x 24 Cedar Rapids Roll
24 x 30 United Iron Works Roll
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Good Condition—Bargains.

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Wanted by an engineering graduate position as superintendent or manager or similar category leading to management in the Rock Products industry. 16 years experience in the Portland Cement and non-metallic mineral processing industries, which included operation research, plant engineering and construction, supervising plant operation and maintenance, cost control, and labor relations. 38 years, Married, Children, Excellent health, and location immaterial. Box M-45, ROCK PRODUCTS, 309 W. Jackson Blvd., Chicago 6, Illinois.

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CRUSHER ENGINEER

Well known national manufacturer with multi-plant mining, quarrying, and manufacturing operations, has opportunity for an engineer with experience with large rock quarrying and processing operations and with knowledge of various types of processing and handling equipment. Experience should include practical application to crushing, grinding, and beneficiation problems for the home office engineering department located in Chicago. Responsibilities will include investigation of problems through to their eventual conclusion. Position is permanent. In replying, please state age, education, experience, and salary desired.

BOX M-50, ROCK PRODUCTS, 309 W. Jackson Boulevard
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Cedarapids Rock-It plant w/2225 jaw, 3033 hammermill.
Telsmith 13B gyratory.
936 Telsmith Wheeling jaw.
10x7 Allis-Chalmers Blake type jaw crusher. Rebuilt.
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Special bins to your specifications.
Conveyors—18"—24"—30"—36". Also belt.
24" dia. x 30" face magnetic pulley.

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Lorain L-820 diesel drag, clam, crane.
Lorain 75B, 1¼ yd. diesel.
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Caterpillar 12 diesel power, scarifier, cab, 1952.
TD9 International with 1-yard Loadover.
TD24 International with Bucyrus-Erie bull-grader.
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600 cu. ft. Gardner-Denver. Rebuilt.
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"THEY NEED MONEY, though. $5,000,000 is still less than 4 cents per American *per year*. Not enough to find the answer *fast* enough—230,000 Americans are going to die of cancer *this year*, they say.

"I'M NOT RICH, but I gave 'em $50 last year—hope to do better this time. After all, where would *I* be if the laboratories working on diabetes, that time, hadn't been given enough support—?"

Cancer
MAN'S CRUELEST ENEMY
Strike back—Give
AMERICAN CANCER SOCIETY

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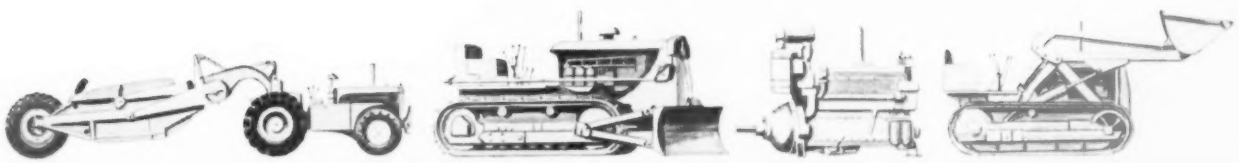

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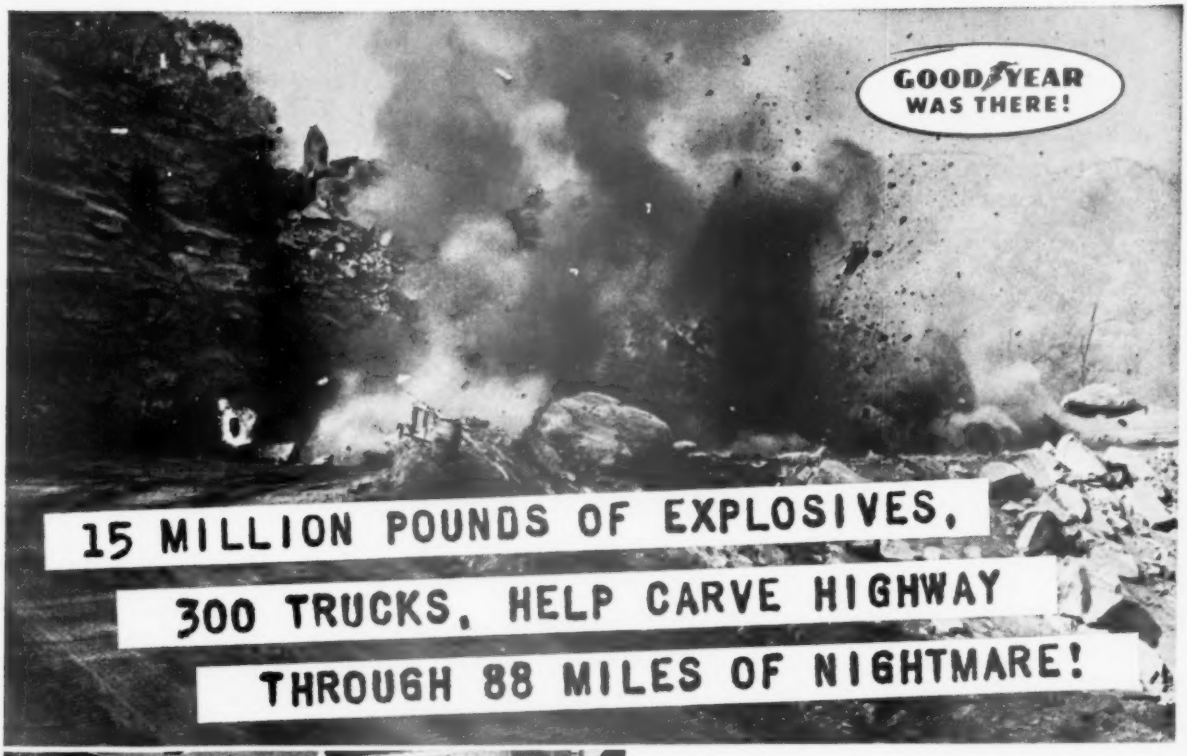

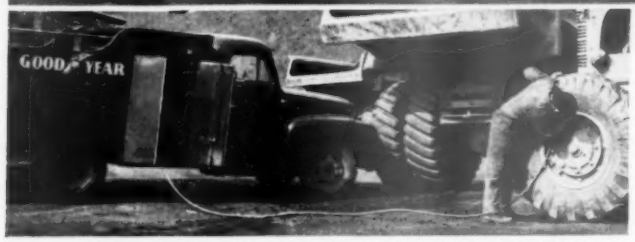

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